

UNIVERSITY OF VAASA
FACULTY OF BUSINESS STUDIES
DEPARTMENT OF ACCOUNTING AND FINANCE

Aaro Hottinen

**THE IMPACT OF CREDIT RATING ANNOUNCEMENTS ON BOND AND
CDS MARKETS IN EUROPE**

Master`s Thesis in
Accounting and Finance
Finance

VAASA 2015

TABLE OF CONTENTS	page
LIST OF FIGURES AND TABLES	5
ABSTRACT	9
1. INTRODUCTION	11
1.1 Purpose of the study	11
1.2 Results shortly	12
1.3 Structure of the study	12
2. LITERATURE REVIEW AND HYPOTHESES	14
2.1 The impact of credit rating announcements on various markets	14
2.3 The criticism against credit rating agencies	19
2.4 The transmission of the financial and sovereign debt crises	20
2.5 The spillover effect of credit rating announcements	21
2.6 Hypotheses	22
3. THEORETICAL BACKGROUND	24
3.1 Efficient market hypothesis (EMH)	24
3.2 Sovereign bonds	25
3.3 Credit Default Swaps	26
3.4 The Credit default swap basis	28
3.5 Credit ratings and credit rating agencies	30
3.6 Financial crisis and Sovereign debt crisis	31
3.6.1 Solving the Eurozone sovereign debt crisis Werner (2014)	31
4. DATA	33
4.1 The credit ratings	33
4.2 Bond data	36
4.3 The CDS data	37
4.4 The CDS basis	38

5. METHODOLOGY	40
5.1 The first hypothesis	40
5.2 The second hypothesis	42
5.3 The third hypothesis	43
6. EMPIRICAL RESULTS	44
6.1 The results for the first hypothesis	44
6.2 The results for the second hypothesis	47
6.3 The results for the third hypothesis	49
7. CONCLUSION	54
REFERENCES	57
APPENDIX 1. Graphs about the cci scale per agency per country	60
APPENDIX 2. CDS spread per country in alphabetical order	67

LIST OF FIGURES AND TABLES

FIGURES

Figure 1. CDS basis per country in alphabetical order from 1.1.2004 to 11.2.2015.	39
--	----

TABLES

Table 1. Previous studies in a timely order	18
Table 2. Credit rating announcements per country (S&P, Moody's and Fitch).	34
Table 3. Credit rating announcements divided per agency.	35
Table 4. The credit rating scale and linear transformation.	36
Table 5. The data starting dates for yields and CDS spreads per country.	38
Table 6. Bond index changes of event countries during rating changes.	44
Table 7. Yield spread changes of event countries during rating changes.	45
Table 8. CDS spread changes of event countries during rating changes.	46
Table 9. CDS basis changes of event countries during rating changes.	46
Table 10. Anticipation of rating changes in a one month window by bond indexes.	47
Table 11. Anticipation of rating changes in a one month window by yield spreads.	48
Table 12. Anticipation of rating changes in a one month window by the CDS market.	48
Table 13. Anticipation of rating changes in a one month window by CDS-basis.	49

Table 14. Bond index changes of event countries during rating changes before and after Lehman Brothers bankruptcy.	50
Table 15. Yield spread changes of event countries during rating changes before and after Lehman Brothers bankruptcy.	51
Table 16. CDS spread changes of event countries during rating changes before and after Lehman Brothers bankruptcy.	52
Table 17. CDS basis changes of event countries during rating changes before and after Lehman Brothers bankruptcy.	53

UNIVERSITY OF VAASA**Faculty of Business Studies****Author:**

Aaro Hottinen

Topic of the thesis:

The impact of credit rating announcements on bond and CDS markets in Europe

Name of the Supervisor:

Janne Äijö

Degree:

Master of Science in Economics and Business Administration

Department:

Department of Accounting and Finance

Major Subject:

Finance

Year of Entering the University:

2009

Year of Completing the Thesis:

2015

Pages: 67

ABSTRACT

The purpose of this thesis is to investigate the impact of credit rating announcements on bond spreads, CDS spreads and CDS basis in Europe. The impact of rating announcements is analyzed for 20 European countries. The data sample begins 30.12.1994 and ends 11.2.2015. This thesis studies the subject from three aspects. Firstly, do the credit rating announcements have an impact on bond and CDS markets? Secondly, can bond and CDS markets anticipate the future credit rating changes? Thirdly, has the impact of credit rating announcements changed before and after the Lehman Brothers' bankruptcy? Additionally the CDS basis is used to study the mispricing between bond and CDS markets.

A fixed effects panel data regression is used for the analysis. The results for the first analysis show that the bond and CDS markets are not totally efficient. As the previous studies have proven, in general, the negative credit rating announcements have an impact on bond and CDS markets.

The bond market is able to anticipate rating changes from S&P and Fitch and negative revisions from Moody's. The CDS market is able to anticipate most of the negative announcements. The CDS basis shows some mispricing between these two markets in a 30 day window before the announcements.

These results indicate that the rating agencies still have a significant role for investors in Europe. The market is able to anticipate the future rating changes, but there is still a large correction in prices around the rating announcement. CDS basis analysis shows that the pricing between bond and CDS markets is effective around the rating announcements.

KEYWORDS: credit rating, sovereign bond, CDS, CDS-basis, sovereign debt crisis

1. INTRODUCTION

During the financial crisis the European Commission has criticized credit rating agencies on worsening the financial crisis. In July 2011 the President of European Commission Jose Manuel Barroso criticized Moody's investor service being biased and speculative after lowering the credit rating of Portugal to junk status. In June 2013 the new regulation for credit rating industry was put into force.

This master's thesis investigates if the credit ratings still have a role in current economy. The impact of credit rating announcements on sovereign bonds, credit default swaps and CDS basis is investigated. The study follows mainly the methodology by Afonso, Furceri and Gomez (2012). The contribution comes from more recent data and taking into account the mispricing between bond and CDS markets in the form of CDS basis. By my knowledge, there have not been any researches that take the CDS basis into consideration. The CDS basis is a key figure that takes into account the difference between the CDS spread and asset swap spread.

There have been a lot of studies about the impact of credit rating changes on bond market, for example Steiner & Heinke (2001), Grande and Parsley (2005) and Afonso, Furceri and Gomez (2012). All of them find out that rating downgrades have a significant effect, but rating upgrades rarely matter. Afonso, Furceri and Gomez (2012) study the impact of credit rating changes on yield spreads and CDS spreads in Europe. They achieve significant results on rating downgrades and the results are more significant for yields than for CDS spreads.

1.1 Purpose of the study

The purpose of this study is to investigate whether the credit rating announcements from the three largest rating agencies - Standard & Poor's, Moody's Investors Service and Fitch Ratings - have an impact on bond-market, CDS market and their common key figure CDS basis. The impact of credit rating announcements on bond and CDS markets is widely studied, but according to my knowledge the impact of credit rating announcements on CDS basis has not been studied in any scientific journal.

The CDS basis is a key figure that connects the bond and CDS markets together and informs about mispricing in these markets. By the efficient market hypothesis a CDS spread and a bond spread should be equally priced to eliminate the arbitrage possibilities. In practice the markets are not totally efficient and mispricing exists occasionally. An imbalance indicates about a turmoil on the market. This mispricing is quickly corrected by the arbitrageurs.

1.2 Results shortly

The results about the impact of credit rating announcements on Bond and CDS markets in Europe are in line with the previous studies. Regardless of a five year longer time period than used by Afonso et al. 2012, the results are within a very small marginal from their results for bond and CDS markets around the rating announcements. Principally only the negative announcements are significant. The CDS basis shows no mispricing in a two-day period.

The anticipation analysis shows that bond market is able to predict rating changes from S&P and Fitch and negative revisions from Moody's. The CDS market is able to anticipate most of the negative announcements. Differing from the two-day analysis the CDS basis shows mispricing between bond and CDS markets in the anticipation analysis.

Interestingly, the impact of credit rating announcements has increased for CDS spreads in the post-Lehman bankruptcy period, when comparing to the pre-Lehman period. The market efficiency has increased for bond yields and the pricing process has improved according to CDS basis. On average the rating actions from S&P and Moody's are more significant than those from Fitch, but the results differ between analyzes. The bond and CDS markets are not fully efficient because some of the rating actions have an impact on these markets.

1.3 Structure of the study

The study is structured as follows: First, the previous studies are presented in chapter 2. The third chapter handles the theoretical background about the main concepts that are essential for the thesis, for example efficient market hypothesis, bond and CDS markets,

credit ratings and financial crisis. The chapter 4 describes the data that is used to perform the analysis. The fifth chapter handles the regression methods used for the analysis. The chapter 6 goes through the empirical results and the final chapter concludes the findings of this study.

2. LITERATURE REVIEW AND HYPOTHESES

This chapter focuses on previous studies about the impact of credit rating announcements on various markets. The earlier studies are presented in a timely order and can be reviewed from the table 1. The chapter 2.1 describes the studies that investigate the impact of credit rating announcements on bond, CDS and capital markets. The chapter 2.2 handles the criticism against credit rating agencies during the financial crisis and sovereign debt crisis. The chapter 2.3 concentrates on the transmission of financial crises between markets and locations. The spillover effect is described in chapter 2.4. The hypotheses of this study are presented in chapter 2.5.

2.1 The impact of credit rating announcements on various markets

John Hull, Mirela Predescu and Alan White (2004) study the relationship between credit default swap spreads, bond yields, and credit rating announcements. The study concentrates on corporate bonds and CDSs. They find that the CDS market is able to predict all negative rating events in advance. There is a significant increase in CDS spreads before rating downgrades. Reviews for downgrade and negative outlooks are anticipated 30 days before the event. Only review for downgrade contains new information on announcement day. They find no significance on positive events.

Hull et al. (2004) also study the predicting power of CDS changes on rating events. They find that 40-50 % of rating events come from top quartile of CDS changes. Most of the future rating changes happen to previously rated companies. This phenomenon is called ratings momentum.

Norden & Weber (2003) study the impact of credit rating announcements on CDS market and stock market during the years 2000-2002. The data consists of company CDS and stock market data from three continents (Asia, United States and Europe). Their results show for example that both CDS and stock markets are able to anticipate the rating downgrades 60-90 days before the announcement day. When analyzing all rating action simultaneously, only the reviews for downgrade from S&P and Moody's are significant.

Ismailescu and Kazemi (2010) study the reaction of emerging market credit default swaps to sovereign credit rating changes. The study has four aspects. First they study whether the credit rating announcements contain new information to CDS market. If the CDS market is efficient, a credit rating announcement has no impact on the market. Secondly, they examine if the CDS spreads can be used for predicting future rating changes. Previous study by Hull et al. (2004) showed that the changes in credit default swap spreads can be used for predicting rating changes in the case of well rated companies. Thirdly, they study the spillover effect and whether the prior announcements have an impact on spillover effect. And lastly they investigate if the economic fundamentals can explain the magnitude of future spillovers.

The results show that emerging markets react differently to credit rating announcements. Credit rating announcements do not bring new information to the market. Only credit rating upgrades have a slight impact on the CDS spreads. This is against the results from other studies (Hull et al. 2004 and Afonso et al. 2012). The CDS market anticipates the future rating announcements in advance. There is also some spillover to non-event markets in the case of positive announcements. As the other studies have shown (Hull et al. 2004, Afonso et al. 2012), the CDS market is useful for predicting the future rating changes.

Afonso et al. (2012) study the effect of credit rating announcements on yield spreads and CDS spreads in Europe from 1995 to 2010. The data consists of 24 EU countries and corresponding credit ratings from Standard & Poor's, Moody's and Fitch. The study has four aspects. First they study, how the yield and CDS markets react to credit rating announcements and whether the effect is anticipated by the markets. They distinguish the difference between EMU and non-EMU countries. Authors also study if the impact of credit rating announcements has changed after the 2008 financial crisis.

Secondly, they study whether the sovereign ratings lead or cause changes in yield and CDS spreads over other yield determinants. Thirdly they study the spillover effect of credit rating announcements from event country to other EU countries. Lastly they study whether the downgrades or upgrades have different impacts on the market. (Afonso et al. 2012).

The findings of Afonso et al. (2012) can be stated as follows:

- The market reacts significantly on rating changes and outlook notations.
- The reaction is especially strong in the case of negative announcements, while positive rating changes hardly influence the market.
- In the case of EMU countries the positive rating events decrease the yields slightly.
- The CDS market reacts more strongly on negative rating effects after the 2008 Lehman brother bankruptcy.
- The spillover effect is especially strong from lower rated countries to higher rated countries.
- Sovereign ratings and yields cause each other in a 1-2 week window. Rating changes are not anticipated in the previous 1-2 months by market.
- The countries that have been downgraded within the last 6 months face higher spreads.

Rasha Alsakka and Owain ap Gwilym (2012) study the impact of credit rating announcements on foreign exchange market from 1994 to 2010. They find that the foreign exchange market reacts to the rating announcements and the negative announcements are more significant than positive. The reactions differ between developed and developing countries and agencies. The rating announcements from Fitch ratings are most significant on majority of tests.

Year 2013, Rasha Alsakka and Owain ap Gwilym (2013) study the market impact and spillovers of credit rating actions on foreign exchange market during the European sovereign debt crisis. They investigate if the actions of the credit rating agencies actually worsened the crisis, but they cannot find any evidence that credit rating agencies would have worsened the crisis on purpose. The market reacts more strongly on the credit rating changes during the crisis but this happens because new information is brought to the market.

The impact of credit rating announcements in a short time scale is studied by Simona Boffelli and Giovanni Urga (2015). They use a specific jump and co-jump model for analyzing the impact of macro announcements and credit rating announcements on 10 year government bond spreads for Belgium, France, Italy, The Netherlands and Spain. A 5 minute data from 1/2009 to 5/2012 is used in the study. Both, the impact in event

country and spillover effect are observed. The event window for macro announcements is -1 hour to +1 hour and for unscheduled credit actions -2 hours to +2 hours. (Boffelli et al 2015).

Boffelli and Urga (2015) find that the macro announcement that concern the real economies of the U.S. and Euro area have the largest impact on bond spreads. For example the employment indicators, production indicators and single country confidence indicators and purchase manager indexes have the most significant influence on the market. For single country events the macro announcements in Germany and Spain have the largest impact on the market. The credit rating announcements hardly impact bond spreads in this short time window. However, the announcements from S&P and Moody's have the largest impact.

The rating actions that consider the largest countries, for example Belgium, Italy and Spain have some impact. The fact that rating actions hardly impact the bond spreads is against the previous studies that use longer time scales (Alsakka and Gwilym 2012, Alsakka and Gwilym 2013). The study by Boffelli et al. (2015) does not take into account the anticipation actions from rating agencies. Other studies have proven that the outlook and review announcements have even larger impact on the market than the actual announcements. (Boffelli et al 2015).

Huong Vu, Rasha Alsakka & Owain ap Gwilym (2015) study the impact of credit rating announcements on bond spreads with split ratings. They find that only the splits between S&P and Moody's have an impact on the market. The credit events from Fitch have no significant market implication. Expectably the downgrades on inferior ratings and upgrades on superior ratings are more significant than vice versa. Standard & Poor's is the most conservative credit rating agency among the three agencies.

Table 1. Previous studies in a timely order.

Year	Author	Topic	Findings
2004	Hull, Predescu & White	The relationship between credit default swap spreads, bond yields and credit rating announcements	The CDS market is able to predict all negative rating events in advance. There is a significant increase in CDS spreads before rating downgrades. Positive events have no impact on the market. Most of the future rating changes happen to previously rated companies.
2010	Ismailescu & Kazemi	The reaction of emerging market credit default swaps to sovereign credit rating changes	Only credit rating upgrades have a slight impact on the CDS spreads. The CDS market anticipates the future rating announcements in advance. The CDS market is useful for predicting future rating changes.
2012	Afonso, Furceri & Gomes	Sovereign credit ratings and financial market linkages: Application to European data	Significant effects especially after negative announcements. The CDS market reacts more strongly to negative rating effects after the 2008 Lehman brother bankruptcy. Spillover effect from lower rated countries to higher rated countries.
2013	Alsakka & ap Gwilym	Rating agencies' signals during the European sovereign debt crisis:	Rating actions affect the own-country exchange rates and have a significant spillover effect on other exchange rates. The impact is stronger during the financial crisis.
2015	Bofelli & Urga	Macroannouncements, bond auctions and rating actions in the European government bond spreads	Credit rating announcements hardly influence bond spreads in 2 to 4 hour windows. Rating actions from S&P and Moody's have the largest impact.
2015	Vu, Alsakka & ap Gwilym	The credit signals that matter most for sovereign bond spreads with split ratings.	Only split ratings between S&P and Moody's are significant. Downgrades of inferior ratings and upgrades on superior ratings are more significant than vice versa.

2.3 The criticism against credit rating agencies

The small amount of credit rating agencies has been criticized in U.S. and in Europe. Michael K. Ong (2002: 87-89) provides two possible reasons for the problem. Firstly, the US Securities and Exchange Commission (SEC) required that the credit rating agencies need to be nationally recognized organizations. After 1975 the regulation has limited the entry of new credit rating agencies. Secondly, he states that the bondholders tend to use only few sources to look for the ratings.

The earning model of the credit rating agencies has also been criticized. The credit rating agencies receive their income from the rated companies. This may cause a moral hazard behavior to provide a good rating in return for a higher compensation. In the U.S. all SEC- registered corporate bonds are rated, but if the company requests for a rating, a one-time fee is charged, but it has an ability to provide information for the formation of rating. This cannot be fully applied for rating of sovereign entities. (Ong 2002: 89-91).

The new rules from The European Commission (2013) to the credit rating industry came in to effect in summer 2013. It is important to study how the market reacts to the new regulation. The new regulation has five main objectives:

1. Reduce overreliance on credit ratings
2. Improve quality of ratings of sovereign debt of EU Member States
3. Make credit rating agencies more accountable for their actions
4. Reduce conflicts of interest due to the issuer pays remuneration model and encourage the entrance of more players on to the credit rating market
5. Publication of ratings on European Rating Platform.

The credit rating agencies did contribute to financial crisis by rating the subprime mortgage securities too laxly, but there is no proof that the credit rating agencies had contributed to the sovereign debt crisis in Europe. One purpose of this study is to analyze if the impact of credit rating announcements on bond and CDS markets has changed after the bankruptcy of Lehman Brothers. If the impact of credit rating announcements has reduced, the overreliance on credit rating announcements has reduced.

2.4 The transmission of the financial and sovereign debt crises

Theoharry Grammatikos and Robert Vermeulen (2012) study the transmission of the financial and sovereign debt crises to the EMU: Stock prices, CDS spreads and exchange rates. They divide the market into three groups: North, South and Small to examine the spreading of crises in different parts of Europe. A daily dataset from 2003 to 2010 is used in the study. Financial and non-financial stock indices are analyzed separately.

Grammatikos and Vermeulen find out that during the financial crisis, the smallest EMU countries are relatively isolated from the U.S. events. This is explained by illiquidity of these markets. The Northern EMU countries are the most linked to the events in the United States. The U.S. financials have a statistically significant impact to North and South EMU countries, but the US non-financials have even greater impact to the EMU non-financials. During the financial crisis the crisis transmission from U.S. non-financials on EMU non-financials is prominent.

Grammatikos and Vermeulen (2012) study the transmission of the sovereign debt crisis in the second part of their study. The Lehman Brothers' bankruptcy is used as a dividing point between the two data samples and the financials and non-financials are also analyzed separately. Before the bankruptcy of Lehman Brothers the CDS spread between Greece and Germany had an impact on the financials of only the smallest EMU countries.

The correlation between the Greece and German CDS spreads was 0.87 before the Lehman bankruptcy and 0.31 after the bankruptcy. The Greek based problems separate the correlation after the bankruptcy. All three groups: North, South and Small are impacted by the Greek CDS spread in the post-Lehman period. The southern countries face the increased default risk of their own in the crisis, while the Northern group faces the problems of possessing large amounts of Greek debt (75 percent of the Greek government debt was in the foreign possession). The Southern group is the most affected by the Greek CDS spread. The financials and non-financials are similarly affected by the Greek CDS spread, but the impact on financials is much stronger.

The third part of the study by Grammatikos & Vermeulen (2012: 530-531) studies the effects of euro-dollar exchange rates during the crisis. The correlation between the euro-

dollar exchange rates and stock prices changes during the crisis. Before the crisis an increase in euro leads into lower return in financial indexes, while during the crisis an increase in U.S. dollar results an increase in financial indexes. This is explained by “harmful to exports” effect before the crisis and “signal of economic strength” effect during the crisis.

Yalin Gündüz & Orcun Kaya (2014) studied the impacts of financial crisis on Eurozone sovereign CDS spreads. They test the long-lasting memory of CDS market using an ARFIMA-FIGARCH model. Granger causality tests are utilized to analyze the causality between CDS volatility and CDS spread. Their findings can be stated as follows: Firstly, they find that the price discovery process fulfills the minimum requirements of market efficiency. This means that the prices reflect all historical information. Secondly, long-memory of volatility is only found from the crisis countries. Long-memory of volatility can be described as the ability to recover from crisis. Thirdly, they find that the sovereign uncertainty spreads from credit default market into stock market. Fourthly, they prove that the shocks tend to spillover from core countries into periphery.

2.5 The spillover effect of credit rating announcements

Amar Grande & David C. Parsley (2005) study the news spillovers in the sovereign debt market from 1991 to 2000. Their dataset consists of all U.S. dollar denominated sovereigns traded on daily basis. The findings show that the spillover effect is asymmetric. Negative events increase other countries sovereign spreads, but positive events have no impact. A one-notch downgrade leads into 12 basis points increase in sovereign spreads of other countries. The spillover effect cumulates; recent similar rating downgrades increase the sovereign spread more than individual rating downgrades.

Benjamin M. Blay and Brian S. Roseman (2014) study the impact of credit rating downgrade of the U.S. on European CDS spreads. The credit rating of the U.S. was downgraded for the first time in the country’s history, on 5 August 2011. Surprisingly - against the theory of CDS spreads - the downgrade decreased the U.S. treasury rates and the CDS spreads remained unchanged. The decrease in treasury rates is explained by fight to safety effect. The decrease of the U.S. credit rating caused the investors to liquidate the riskier investments and transfer the money into safer treasury bonds.

Whereas in Europe, the decrease of the U.S. credit rating led into increase in the CDS spreads. Especially the countries with lowest GDP and the countries that had not been downgraded lately had a significant increase in CDS spreads. Also the countries in EMU had a significant increase in CDS spreads. (Blay et al. 2014: 131.)

Blay & Roseman (2014) used three time windows in their research, pre-downgrade-, downgrade- and post-downgrade periods. The results indicate that the European CDS spreads anticipated the incoming U.S downgrade and increased already in the pre-downgrade period. The decrease is both statically and economically significant. During the downgrade period the CDS spreads and corresponding volatility experienced high levels. The levels remained high also in post-downgrade period.

Blay & Roseman state that their results are in line with the previous studies for example with Norden and Weber 2004. The CDS market is able to anticipate the upcoming negative market events. In contrast to the study by Afonso et al. (2012) the downgrade of a well rated country has a significant impact on the market. The authors remark that the results of this study must be dealt with caution. There is only one event in the study, because the U.S. credit rating has been downgraded only once during its history. Other simultaneous events could have distorted the results. Unreported tests prove that multicollinearity does not exist.

Rasha Alsakka, Owain ap Gwilym & Tuyet Nhung Vu (2014) study the impact of sovereign rating downgrades to banking sector during the European debt crisis. They find that the credit rating downgrades are not linked into bank ratings before the crisis, but the linkage exists during the crisis. Both sovereign rating downgrades and negative watch signals have strong linkage to bank rating downgrades. Multiple-notch downgrades from S&P have the strongest impact on bank ratings. On average a bank has two notches lower rating than the corresponding sovereign.

2.6 Hypotheses

Three different hypotheses are studied in this thesis. The first hypothesis investigates if the sovereign debt market (CDS market) is efficient. Referring to Efficient Market Hypothesis (EMH) there should be no new information in the credit rating announcements. CRAs use publicly available information to create the credit ratings.

H1: Sovereign debt market (CDS market) is efficient and not effected by rating announcements.

The second hypothesis analyzes the predicting power of bond market, CDS market and CDS basis. The previous studies have shown that the CDS market anticipates the future rating changes for developing markets one month before the announcement. This hypothesis analyzes if this is true for European market.

H2: The bond (CDS) market anticipates the future credit rating change.

The third hypothesis examines if the credit rating announcements have different impacts on bond and CDS markets before and after Lehman Brothers' bankruptcy. If the impact of these announcements has reduced or disappeared, the markets have become more efficient. In theory the market should be more efficient nowadays.

H3: The bond (CDS) market reaction to sovereign credit ratings has not changed in time.

3. THEORETICAL BACKGROUND

The purpose of this thesis is to study the impact of credit rating announcements on bond (CDS) market in Europe. In this chapter I go through all the main concepts that are essential for understanding the subject. Concepts like efficient market hypothesis, sovereign bonds, credit default swaps, credit default swap basis and credit ratings are handled.

3.1 Efficient market hypothesis (EMH)

In 1970 Eugene F. Fama presented his article “Efficient Capital Markets: A Review of Theory and Empirical Work”, which is the fundament for the efficient market hypothesis. Efficient market hypothesis states that all available information is instantly taken into account in the prices. This would mean that credit rating announcements would not have any impact on the market. Credit rating agencies use publicly available data to construct the ratings and this data should already be taken into account in the prices. There are three forms of tests for efficient markets: weak-form, semi strong-form and strong-form.

Weak form of efficiency means that current prices reflect all the information from the historical prices. Semi-strong-form of efficiency means that prices include all obviously publicly available information. Strong-form of efficiency means that prices include even the information that is only available to investors or groups that have monopolistic access to the data. The study (Fama 1970: 414-415) states that the tests strongly support weak-form of efficiency. Semi-strong form of efficiency is also supported in majority of the tests. Only strong-form of efficiency can be discarded, because of proof about profitable insider trading.

In practice, the market reacts to the credit rating announcements (Hull et al. 2004, Ismailescu et al. 2010 and Afonso et al. 2012). Many sorts of anomalies like January effect, Days of the Week, Seasonal Affective Disorder (SAD) et cetera, exists in the market. Fama (1970: 146) mentioned that the subject needs more studying and there are shortages in the study. In the academic world the efficient market hypothesis was overly trusted from the 70's. Only during the past years the academic world has

admitted the inefficiency of the markets. In practice the market anomalies are rather a norm than an exception. The term anomaly can be stated misleading.

3.2 Sovereign bonds

A sovereign bond is a debt security issued by a sovereign government. The government issues a bond, which obligates it to pay specified payments to the purchaser of the bond on specific dates. The bond may consist of annual/semiannual payment or solely of the face value of the bond. The bond price is calculated using formula 1. The summation presents the annual/semiannual coupon payments and the latter part of the formula presents the face value paid at maturity. (Bodie, Kane & Marcus 2011: 474-478).

$$(1) \quad P_B = \sum_{t=1}^T \frac{Coupon}{(1+r)^t} + \frac{Par\ value}{(1+r)^T}$$

Where,

P_B = price of the bond

C = coupon payments

T = Periods to maturity

r = discount rate

A government bond can be a zero-coupon bond, which means that there are no interest payments during the loan period. The investor receives the face value at maturity. The formula 2 presents the valuation of a zero coupon bond. (Bodie et al. 2011: 474-478).

$$(2) \quad P_{zcb} = \frac{ParValue}{(1+r)^T}$$

The governments issue debt to compensate their budget deficits. There are other ways for financing budget deficit, like selling government assets and raising the amount of money in the market. In the Eurozone the governments have renounced their right to regulate the amount of money, which means that the debt financing is even more

important for these countries. Selling government assets is rarely a good source for financing in the long run.

The cost of capital for a sovereign issuer is calculated as a bond spread. Bond spread is a difference between a yield of an AAA-rated issuer and a yield of lower rated issuer. In Europe the bond spread is generally calculated with respect to German Bund. The German bunds are often considered as a “safe haven” among the sovereign issuers. Formerly the spread was calculated in Europe with respect to the bond of the United Kingdom.

Credit risk of international sovereign bonds is measured by credit rating agencies, for example Standard & Poor’s, Moody’s Investors Services and Fitch Ratings. Sovereign bonds are often considered as risk free investments, but this is not the case, at least for emerging markets. Credit ratings are often divided into two groups: investment-grade bonds and speculative-grade/junk bonds. Investment grade bonds are rated BBB/Baa (S&P and Fitch/Moody’s) or above. (Bodie et al. 2011: 496-498.)

3.3 Credit Default Swaps

Credit default swap is an instrument that is used as an insurance policy against the default of a company or a sovereign entity. The CDS buyer pays an annual premium and the seller is bound to compensate for the loss of the buyer in the event of a default. There are two ways for the compensation in the case of default, physical settlement and cash settlement. A physical settlement means that the issuer accepts the defaulted bond and pays the par value to the insurance taker. A cash settlement means that the insurance taker holds onto bond and the CDS issuer pays the difference between the par value of a bond and its market value. (Bodie et al. 2011: 496-498.)

The price of a credit default swap price consists of two legs: one leg consists of the premium payments and the other leg consists of the contingent default payment. The present value is calculated as a sum of present values of these payments. The theoretical valuation formula can be seen in formula 3. (Choudhry 2010: 251-254.)

$$(3) \quad s = \frac{\int_0^T [1 - R - A_t R] q_t v_t dt}{\int_0^T q_t [u_t + e_t] dt + \pi u_t}$$

Where, dividend presents the expected payoffs from the CDS contract

Divider presents the value of payments made by the buyer.

s = CDS spread

T = life of CDS in years

q_t = risk neutral probability density at time t

R = expected recovery rate on the reference obligation in a risk neutral world

A_t = accrued interest on the reference obligation at time t as a percent of face value

u_t = present value of payments at rate of 1\$ per year on payment dates between $t=0$ and time t

e_t = present value of an accrual payment at time t equal to $t-t^*$, where t^* is the payment date immediately after t .

v_t = present value of 1\$ received at time t

π = the risk neutral probability of no credit event during the life of the swap

(Choudhry 2010: 251-254.)

Market practitioners use a discrete form pricing approach instead of the theoretical model, this is presented in formula 4.

$$(4) \quad s_N = (1 - R) \sum_{i=1}^N \frac{DF_i(PND_{i-1}PND_i)}{\sum_{i=1}^N DF_i PND_i A_i + (PND_{i-1} - PND_i) \frac{A_i}{2}}$$

Where, the dividend presents the present value of contingent leg and the divider presents the present value of fee leg (no default + default accrual).

s_N = par spread for maturity N

DF_i = discount factor from time $t=0$ to $t=i$

PND_i = probability of no default from $t=0$ to $t=i$

A_i = accrual period from T_{i-1} to T_i

(Choudhry 2010: 254-257.)

Credit default swaps are used by large bondholders and banks to control the credit risk. A bondholder can buy lower rated bonds and secure the position by using credit default swaps. A lower rated bond together with a CDS contract can be considered as an AAA rated investment. The possibility of default of the CDS issuer must be taken into account. The price of a credit default swap is calculated as a premium between AAA rated bond and the bond that is secured. (Bodie et al. 2011: 496-498.)

Credit default swaps were made to secure bond investments but are commonly used for speculating the health of a company or sovereign. In the case of Lehman Brothers bankruptcy, a total worth of \$400 billion CDS contracts were outstanding in the market, while the worth of Lehman Brothers bonds was only \$150 billion. This kind of

situations can have massive impacts to the financial world. The problem during the credit meltdown of 2008 was the lack of transparency in the CDS market. CDS contracts are two sided contracts that are traded over the counter. This means that monitoring the market is difficult. The overall risk was hidden from the market participants. (Bodie et al. 2011: 496-498.)

John Hull, Mirela Perdescu and Alan White (2004) study the relationship between credit default swap spreads, bond yields, and credit rating announcements. They study which benchmark risk-free rate is used by market participants on CDS market. They find that the market participants use the zero swap rates as a risk free rate rather than the treasury rate used in literature.

3.4 The Credit default swap basis

The credit default swap basis (CDS basis) is a key figure that measures market sentiment between synthetic and money markets. The figure describes the mispricing of these instruments. The CDS basis can be explained as a difference between the price of a CDS and asset swap spread in money market. Theoretically the CDS price should be equal to asset swap spread, but they commonly differ in practice. CDS contracts are solely made for trading credit risk, while bond prices are affected by multiple factors. Variation in supply and demand has also an impact on the basis. (Choudhry 2010: 358-359.)

The CDS basis can be used as a market indicator. The varying demand of cash in contrast to synthetic risk describes the market sentiment. Generally the CDS market leads the money market, but in some cases it goes the other way round. The leading role of the CDS market is explained by better liquidity. CDS contracts can be traded in large quantities without impacting the market. (Choudhry 2010: 359-361.)

$$(5) \quad \text{CDS basis} = \text{Credit default spread (D)} - \text{Asset swap spread (S)}$$

The CDS basis can be calculated as presented in formula 5, where asset swap spread is the spread between the asset and risk free rate. For example the yield of Greece minus the yield of Germany, where the yield of Germany is considered as a risk free rate. The

CDS basis is typically positive, but if the asset swap spread is larger than the CDS spread, the market provides arbitrage possibilities. The greater demand of CDS contracts drives the basis to negative, but other factors drive it to positive. (Choudhry 2010: 359-361.)

The driving factors behind the basis can be divided into two subgroups: technical factors and market factors. Technical factors include the following aspects: CDS premiums, counterparty risk, greater protection level, accrued coupon and legal risks. The CDS premium should trade positive, because the insurance taker pays the premium to the CDS issuer. Greater protection level forces the CDS issuers to demand larger premiums, because the CDS contracts often enter into force even in technical defaults, when the cash bond does not lose its value. (Choudhry 2004: 13-19)

The market factors include the following aspects: market demand, liquidity premium, shortage of cash assets, structured finance market and new market issuances. Strong market demand drives the CDS premiums wider if the demand does not meet with supply. Structured finance market has improved the liquidity of CDS market by providing large amounts of CDO (collateralized debt obligation) contracts. CDO contracts consist of multiple CDS contracts and require both issuers and insurance takers. Increased demand from both sides decreases premiums. New bond issuances can drive the basis in both ways. Investors might rush for the newly issued bond, but simultaneously investors might hedge the position by buying a CDS contract. (Choudhry 2004: 19-21)

Choudhry (2004: 22) lists the factors that drive the basis wider: “CDS premiums above zero, the delivery option, accrued coupon, bond price below par, funding below Libor, legal and documentation risk, market liquidity, new bond issuance and difficulty of shorting cash bonds”. And the factors that drive the basis lower: “counterparty risk, bond priced above par, funding above Libor and impact of the structured finance market”.

A phenomenon called “basis smile” means that both lowly and highly rated assets sell at higher than average basis. The higher price of highly rated protection is a result from the insurance buyer ending up paying over Libor rate premiums. The CDS issuer will demand for a higher premium. A negative basis is still more common on highly rated assets, but a negative basis tends to be only temporary. An arbitrage possibility forming from negative basis will drive the basis back to negative. (Choudhry 2004: 21-22)

In this thesis I study, whether the credit rating changes have an impact on CDS basis. First I study the impact on bond spreads and CDS spreads separately and CDS basis links these two spreads together. I also test if the CDS basis can be used for predicting future rating changes.

3.5 Credit ratings and credit rating agencies

The three largest credit rating agencies are called Standard & Poor's, Moody's Investors Service and Fitch Ratings. Abbreviations S&P, Moody's and Fitch are used generally in the thesis. The first two agencies come from the United States and Fitch Ratings is European, but all these act globally. Credit rating agencies produce ratings to help investors to invest into less known markets. A credit rating gives a picture about the possible default risk of the issuer, for example a sovereign entity.

Michael K. Ong (2002) states that credit rating is a dynamic process. Rating changes along time and reflects the general fundamentals of the firm and simultaneously the economic conditions as a whole. This can also be applied on rating of sovereign entities. According to Ong the credit rating is also a forward-looking process. The purpose of the rating process is to forecast the future outcomes. The rating updating schedule defines the precision of the forecast. (Ong 2002). The rating should be as accurate as possible, but the rating agencies aim at stability of ratings. The rating announcements should not be withdrawn easily. For example an institutional investor might be forced to sell their investment due to a rating downgrade and fast moving ratings would complicate the use of ratings.

Credit rating agencies use publicly available data to form the ratings. This means that if the markets were perfectly efficient these ratings would not have any impact on the market. All the information would be already in the prices. In practice several studies have proven that credit rating announcements have an impact on the markets (Hull et al. 2004, Ismailescu et al. 2010, Afonso et al. 2012 and etc.). The credit rating agencies are even criticized of having too much power on the market and causing the financial crisis (Alsakka et al. 2013). Many funds and institutional investors are bound to invest into certain rating groups. A surprising decrease in a rating may force large amount of institutional investors to sell their investments simultaneously and this can lead into steep decrease in prices.

3.6 Financial crisis and Sovereign debt crisis

The financial crisis developed in the United States during the year 2007. The market participants were unaware about the low creditworthiness of the subprime-mortgage backed securities. In February 2007, the Federal Home Loan Mortgage Corporation Freddie Mac stopped buying the most risky subprime mortgage securities. In June the credit rating agencies Standard and Poor's and Moody's Investor services downgraded over hundred bonds backed by second lien subprime mortgages. The credit rating agencies are accused of causing the financial crisis. (Federal Reserve Bank of ST. Louis 2011).

The European sovereign debt crisis accumulated in the steps of the financial crisis. The problem of the Euro currency is that there is no single authority that is able to control taxes, spending and transfers between the richer and poorer EMU countries. Some of the EMU countries lost the trust of financial markets, which led into sovereign debt crisis. (Grammatikos & Vermeulen 2012: 518).

The banking sector and sovereign debt markets are closely linked together. The banking sector holds large part of home country sovereign debt, which exposes the banking sector to sovereign risks. Simultaneously the sovereign is seen as a guarantor for the banking sector. The next sub-chapter 3.6.1 handles one example of the possible corrective actions to solve the European sovereign debt crisis. Werner proposes that the states should return to lend from their own bank sectors rather than from international capital markets. (Werner 2014).

3.6.1 Solving the Eurozone sovereign debt crisis Werner (2014)

Werner (2014) states that: "Enhanced Debt Management is an attractive option to end the Eurozone sovereign debt crisis". By Enhanced Debt Management he means that the governments should return to lending from banks in the form of ordinary bank loans. IMF/World bank manual emphasizes that direct bank lending of governments is actively discouraged in the past 20 years, which might be a mistake. Only bank sector has the ability to accumulate more GDP growth by credit creation which is lost in a bond issuance. Bank credit creation is the strongest determinant of nominal GDP growth.

Werner lists the aspects that support the EDM for government funding as follows (Werner 2014: 465-466):

“

1. Bank loan contracts are not tradable and do not have to be marked to market. Speculative attacks on the debt are impossible.
2. During the crisis, untraded bank loan funding has remained significantly cheaper than traded Bond finance for governments. It is surprising that debt management offices have not switched from bond issuance to borrowing from banks via loan contracts. Italy in 2012 could have saved billions of euros thanks to lower interest charges.
3. With EDM, sovereign credit ratings are not needed (saving costs) and rating downgrades would be irrelevant, not affecting banks' balance sheets or the government's ability to borrow from banks.
4. Bank loans are available domestically and hence deliver a more stable debt structure, independent from borrowing from abroad.
5. When banks need to generate returns as reserves or capital buffers, a sustainable method is to allow them to earn these through growth, by lending to the government.
6. Bank credit creation for transactions that are part of GDP has been identified as the main determinant of nominal GDP growth. Hence an increase in bank credit is required to boost nominal GDP. By borrowing from banks, governments can pump-prime bank credit creation. This boosts nominal GDP growth and hence domestic demand, resulting in greater employment, lower expenditure on unemployment benefits, greater tax revenues and hence lower deficits and also larger GDP, lowering the deficit/GDP and debt/GDP ratios by lowering the numerator and increasing the denominator.
7. The bank loans are available from domestic banks without the need to request government assistance from the Troika, and thus avoid the intrusive conditionality, including deflationary structural supply-side reforms or cuts in welfare or education budgets.
8. The banks could create the required funds out of nothing by crediting the government's accounts with. No capital is required for such bank lending to the sovereign according to the Basel rules.
9. The government would save the bond issuance fee, which may be small in percentages, but can be substantial in absolute amounts.
10. Finally, banks are able to utilize these non-tradable loans as sovereign collateral with the ECB to refinance themselves.”

The possibility to prevent the dependence on credit ratings and market speculation is strongly in favor of bank lending for sovereign entities. If the credit creation is as strong as Werner states the EDM should be studied more as an alternative to bond funding. All sovereign governments would benefit from increased GDP growth. Simultaneously the banking sector would benefit from decreased risks in possessing risky government bonds.

4. DATA

The purpose of this thesis is to investigate if the sovereign credit rating announcements have an impact on bond spreads, CDS spreads and CDS bases in Europe. Three different datasets are used: credit rating data from the three credit rating agencies S&P, Fitch and Moody's, 10 year government bond data and 5 year CDS data. The data sample for bond data begins 30.12.1994 and ends 11.2.2015. The sample size for credit rating data and CDS data varies among countries. Daily data is used because it is necessary for being able to observe short term changes. The impact of credit rating announcements is measured in [-1 to 1] and [-30 to -1] time windows.

This thesis analyses the impact of credit rating announcements on 20 European countries. The sample length of the CDS data varies a lot among countries. The following European countries are chosen for the analysis: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Spain, Sweden and United Kingdom. Afonso et al. (2012) use the data of 20 European countries from 1995 to 2010. This thesis extends the sample length of their study for 5 years.

4.1 The credit ratings

First, the credit rating announcements and corresponding watch/outlook notations are used to measure the credit risk. This data is achieved from the three credit rating agencies S&P, Fitch and Moody's. Both, actual rating changes and short term rating data from the three biggest credit rating agencies S&P, Fitch and Moody's are used for the thesis. Many of the previous studies prove that the short term ratings are even more significant than the actual ratings. Only the outlook notations that occur outside rating change are used to prevent correlation with actual rating changes. In total 421 rating announcements from S&P, Moody's and Fitch occur in the timeframe of the study.

The number of credit rating announcements per country and CRA can be seen in table 2. To clarify the activity of each CRA the table 3 describes these announcements per agency. It can be seen that the amount on upgrades and downgrades is fairly similar among the agencies, but the amount of outlook/watch notations differs considerably. The Fitch ratings have announced 92 watch/outlook notations outside actual rating

changes, while Standard & Poor's has only announced 14 announcements. Standard & Poor's has a tendency to release the credit watch/outlook notations simultaneously with credit ratings, which reduces the amount of revisions in this sample. This is why the results of positive revisions are not available for S&P in all the samples. Dummy variables are used to indicate rating changes. For example the dummies for S&P are: S&PUp, S&PDown, S&PPositive and S&PNegative.

Table 2. Credit rating announcements per country (S&P, Moody's and Fitch).

	Upgrade	Downgrade	Positive	Negative
Austria	-	1(1,0,0)	-	-
Belgium	2(0,0,2)	4(1,1,2)	-	6(0,1,5)
Czech	8(3,2,3)	2(1,0,1)	3(0,1,2)	-
Denmark	3(1,1,1)	-	-	-
Finland	8(3,2,3)	1(1,0,0)	-	-
France	-	5(2,1,2)	-	3(0,0,3)
Germany	-	-	-	-
Greece	18(6,4,8)	22(8,6,8)	6(0,1,5)	10(1,5,4)
Hungary	12(4,5,3)	14(5,5,4)	6(1,3,2)	18(6,2,8)
Ireland	11(5,4,2)	15(6,5,4)	4(2,2,0)	10(3,2,5)
Italy	3(0,2,1)	14(6,3,5)	1(0,1,0)	8(0,1,7)
Latvia	16(7,3,6)	12(5,3,4)	6(1,0,5)	5(0,0,5)
Lithuania	15(4,4,7)	8(3,2,3)	9(0,2,7)	2(0,1,1)
Netherlands	-	1(1,0,0)	-	3(0,0,3)
Poland	9(4,2,3)	-	6(0,0,6)	-
Portugal	6(1,4,1)	16(6,5,5)	2(0,0,2)	10(0,2,8)
Romania	19(7,5,7)	8(3,2,3)	3(0,0,3)	4(0,0,4)
Spain	8(3,2,3)	15(6,5,4)	1(0,1,0)	6(0,3,3)
Sweden	7(1,3,3)	1(0,1,0)	2(0,1,1)	-
UK	-	2(0,1,1)	-	3(0,0,3)
Total	145	141	49	86

Note: The timeframe is from 30.12.1994 to 11.2.2015. For example for Greece upgrades 18(6,4,8) means that Greece has received in total 18 upgrades of which 6 from S&P, 4 from Moody's and 8 from Fitch. When both rating changes and revisions happen on the same day, only actual rating change is presented.

Table 3. Credit rating announcements divided per agency 30.12.1994 to 11.2.2015.

	Upgrade	Downgrade	Positive	Negative	SUM
S&P	49	55	4	10	118
Moody's	43	40	12	17	112
Fitch	53	46	33	59	191
Total	145	141	49	86	421

Such as in the study by Afonso et al. (2012) the credit ratings are transformed into numerical CCR scale. The worst rating gets the value of 0 and the best rating gets the value 17. This makes it possible to compare the ratings between the agencies. The CCI scales per country can be seen in appendix 1. The linear transformation is presented in table 4. All ratings below CCC/Caa2/CCC get the value of zero, because the data is not comparable in the state of bankruptcy.

Table 4. The credit rating scale and linear transformation.

Rating agency			Linear transformation	Rating quality
S&P	Moody's	Fitch		
AAA	Aaa	AAA	17	Investment grade
AA+	Aa1	AA+	16	
AA	Aa2	AA	15	
AA-	Aa3	AA-	14	
A+	A1	A+	13	
A	A2	A	12	
A-	A3	A-	11	
BBB+	Baa1	BBB+	10	
BBB	Baa2	BBB	9	
BBB-	Baa3	BBB-	8	Speculative Grade
BB+	Ba1	BB+	7	
BB	Ba2	BB	6	
BB-	Ba3	BB-	5	
B+	B1	B+	4	
B	B2	B	3	
B-	B3	B-	2	
CCC+	Caa1	CCC+	1	
CCC	Caa2	CCC		
CCC-	Caa3	CCC-		
CC	Ca	CC		
C		C		
D	C	DDD		Default
SD		DD		
D		D		

4.2 Bond data

A 10 year government bond data for the 20 European countries is achieved from the DataStream. Both yield data and bond index data are used. Daily yield data was not available for 5 countries Austria, Ireland, Italy, Netherlands and Poland. The yield data is used for creating the bond spreads and further for constructing the CDS bases. The bond index data is more comprehensive when considering the sample size. The daily data is available for all 20 countries.

The yield spread is calculated as a difference between 10 year governments bonds yield over the risk free yield (formula 6). The 10 year bond of Germany is considered as a risk free bond in this study. This method is similar than used by Afonso et al. (2012). In the alternative analysis, both yield and CDS spread data is also adjusted as a difference between country yield spread and country average of yield spreads. This is done to prevent the high correlation between the sovereign spreads (Afonso et al. 2012: 611-612).

$$(6) \quad \text{Yield spread} = \text{bond yield} - \text{risk free rate}$$

4.3 The CDS data

The 5 year CDS spreads are achieved from the DataStream. The impact of credit rating announcements on CDS spreads is measured using the same methodology than for the yield spreads. Additionally, the CDS bases are constructed from the yield spreads and CDS spreads. The availability of CDS data restricts the sample periods used for CDS analysis. Table 5 presents the different starting dates for data samples per country. The dates marked with * mean that the data sample ends before 11.2.2015. The CDS spread for France is only available between 16.8.2005 – 30.09.2010 and the CDS spread for United Kingdom is available between 13.11.2007 – 30.9.2010. It can be seen from the table 4 that the data is most limited for the countries from Eastern Europe, while western countries have data for the whole sample.

Table 5. The data starting dates for yields and CDS spreads per country.

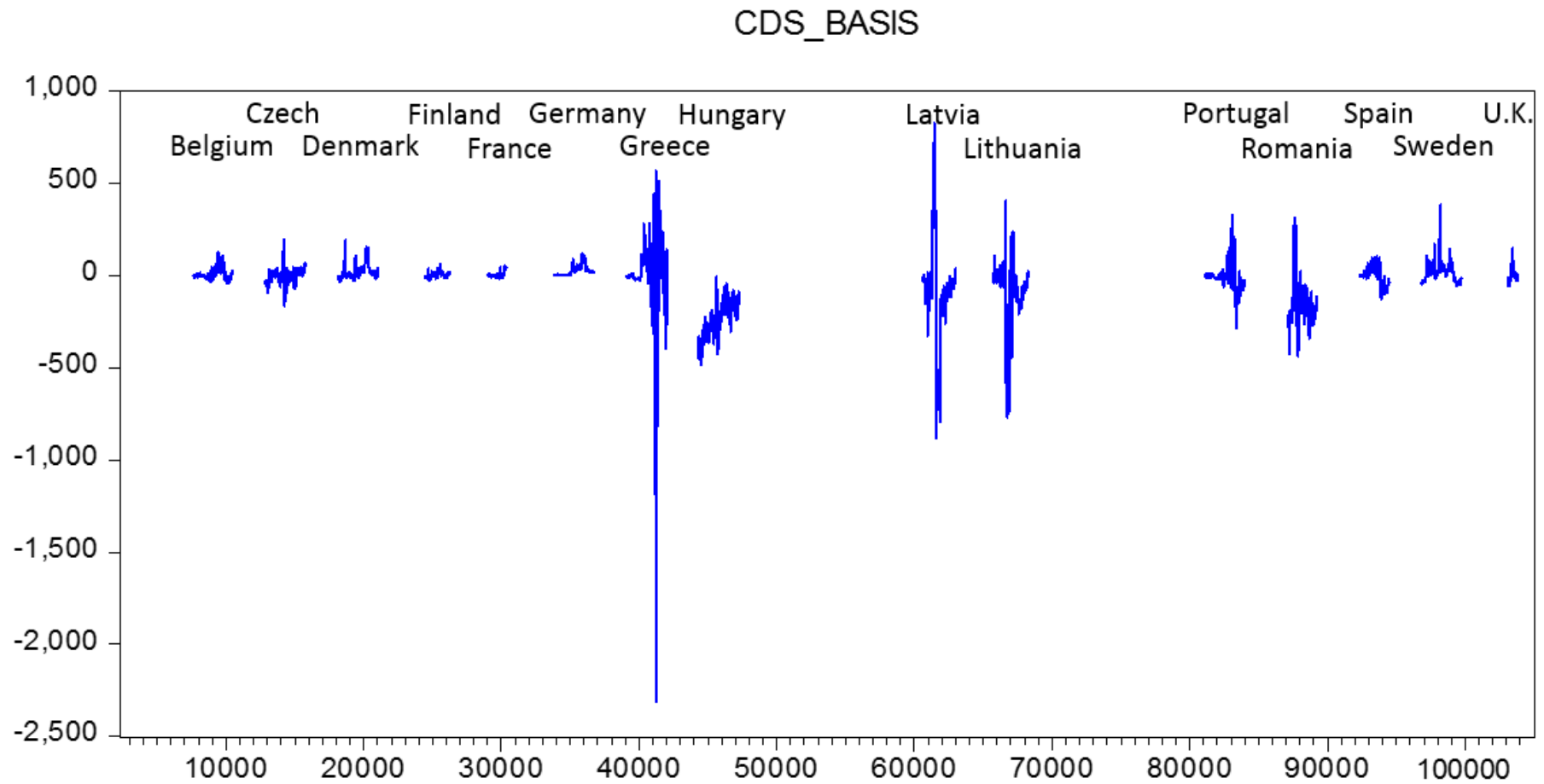
Country	Bond index data	Yield spread data	CDS data
Austria	30.12.1994	-	6.1.2004
Belgium	30.12.1994	19.5.1995	5.1.2004
Czech Republic	28.4.2000	1.5.2000	6.1.2004
Denmark	30.12.1994	22.5.1995	8.9.2003
Finland	30.12.1994	19.5.1995	18.3.2008
France	30.12.1994	19.5.1995	*16.8.2005
Germany	30.12.1994	30.12.1994	8.1.2004
Greece	31.3.1999	23.3.1998	9.1.2004
Hungary	19.1.1999	19.1.1999	1.1.2004
Ireland	30.12.1994	-	23.6.2006
Italy	30.12.1994	-	20.1.2004
Latvia	7.10.2004	7.10.2004	13.1.2006
Lithuania	15.4.2003	15.4.2003	6.6.2005
Netherlands	30.12.1994	-	23.10.2006
Poland	29.12.2000	-	1.1.2004
Portugal	30.12.1994	19.5.1995	26.1.2004
Romania	22.2.2007	22.2.2007	1.1.2004
Spain	30.12.1994	19.5.1995	23.10.2006
Sweden	30.12.1994	2.1.1995	11.8.2003
United Kingdom	30.12.1994	19.5.1995	*13.11.2007

Note: * the CDS data for France and United Kingdom ends 30.9.2010.

4.4 The CDS basis

The CDS basis is calculated using formula 5 in chapter 3.4. It can be seen from the table 5 that the data for yield spread is missing for Austria, Ireland, Italy, Netherlands and Poland. It means that the CDS basis cannot be calculated for these 5 countries. The CDS basis per country can be seen in figure 1. It can be seen that the CDS basis is the most volatile for Greece.

Figure 1. CDS basis per country in alphabetical order from 1.1.2004 to 11.2.2015.



Note: The data for Austria, Ireland, Italy, Netherlands and Poland is missing because the yield data is not available for these countries.

5. METHODOLOGY

The event study methodology by Afonso et al. (2012) is followed in this thesis. Additionally the impact of credit rating announcements on CDS basis is studied. A fixed effects panel data regression is used for the analysis.

When using an ordinary event study methodology the regression analysis is first performed during the time before the event. Abnormal return is calculated using formula 7. The credit rating announcements occur so frequently that it is not possible to perform the regression for pre-event window. This is the reason why R_{Mt} is replaced by the return of German Bund in this study as in the study by Afonso et al. (2012).

$$(7) \quad AR_{it} = R_{it} - R_{Mt}$$

5.1 The first hypothesis

The first hypothesis investigates if the bond (CDS) market is efficient and not effected by credit rating announcements. The impact of a credit rating announcement on yield spreads, CDS spreads and CDS basis is studied. Dummy variables are used to indicate rating changes. For example the following dummies are used for S&P: S&PUp, S&PDown, S&PPositive and S&PNegative, where up and down present actual rating changes and Positive and Negative present the outlook of the rating.

A country (and time) fixed effects panel regression is used for the analysis. The panel data regression combines the cross-section data together with time series data, and allows dynamic hypotheses. The fixed effects model is effective, when analyzing time varying changes within the entities. This requires that the variables vary in time. The use of panel data increases the sample size, which reduces the collinearity. The problem of using panel data is time-varying heterogeneity, which is tested with chi-squared test. The panel data that is used is mostly balanced for the bond data, but the availability of CDS data has lots of variation. The use of panel data helps to prevent the specification problem (Afonso et al. 2012). The country fixed effects panel regression is presented in formula 8. The formula 11 takes into account the change on yield in a $[1,-1]$ time window and is utilized within the formula 9.

$$(8) \quad S_{it} = \alpha_i + \rho S_{it-1} + \beta D_{it} + \varepsilon_{it}$$

Where,

S states the adjusted measures for yields

α_i refers to country fixed effects

D is a dummy variable for rating change.

All credit rating actions are taken into account by using separate dummies for each 4 announcements for all 3 agencies, in total 12 different dummies are used. The rating actions can be seen separated in formulas 4 and 5.

$$(9) \quad \Delta S_i = \alpha_i + \sum_{k=1}^3 \beta U_{it} + \sum_{k=1}^3 \gamma D_{it} + \sum_{k=1}^3 \delta P_{it} + \sum_{k=1}^3 \theta N_{it} + \varepsilon_{it}$$

Where, U presents the regression coefficient for upgrades, D for downgrades, P for positive revisions and N for negative revisions. The impact of each credit rating agency is presented in the summation, which is opened in formula 10 for upgrades.

$$(10) \quad \sum_{k=1}^3 \beta U_{it} = \lambda U_{it} + \mu U_{it} + \rho U_{it}$$

Where, λ presents the regression coefficient for upgrade from S&P, μ for Moody's and ρ for Fitch.

$$(11) \quad \Delta S_i = S_{it+1} - S_{it-1}$$

Where, S states the adjusted measures for yields (CDS spread), α_i refers to country fixed effects and D is a dummy variable for rating change. K presents the 3 credit rating agencies.

In practice, all credit rating actions are taken into account by using separate dummies for each 4 announcements for all 3 agencies, in total 12 different dummies are used, which is shown in formula 9. The same regression is performed for bond indexes, yield spreads, CDS spreads and CDS basis. The regression for bond indexes does not take into account the market return. The balanced market return portfolio that is constructed for these 20 countries is stationary and thereby impossible to use in a fixed effects regression.

The CDS basis is calculated using the formula 5, presented in chapter 3.4, where the asset swap spread is the difference between country yield spread and the spread of German bund. The CDS basis replaces the adjusted measures for yields in formula 8. The formula 9 is used for the regression, where ΔS_i is replaced with a change in CDS basis in a [1,-1] time window.

5.2 The second hypothesis

The second hypothesis analyzes the anticipation of credit rating announcements by Bond market, CDS market and CDS basis. When studying the developing markets, Ismailescu & Kazemi (2010) find that CDS market anticipates the change at least a month prior to the change. Afonso et al. (2012: 617, 619) test the anticipation in two time windows [-30,-1] and [-60,-1], but they only analyze the positive and negative announcements separately. They find that the CDS market is able to anticipate negative events in a 60 day time window. In this thesis the anticipation is studied separately for each 12 rating actions.

The second hypothesis investigates if a credit rating change is anticipated by the market in a time period of [-30, -1]. The analysis is performed by using formula 9 and changing the ΔS_i as seen in formula 12. The regressions are performed for bond indexes, yield spreads, CDS spreads and CDS basis.

$$(12) \quad \Delta S_i = S_{it-1} - S_{it-30}$$

5.3 The third hypothesis

The third hypothesis analyzes if the impact of credit rating announcements has changed over time. The credit rating agencies were accused of worsening the crisis and having too much power during the financial crisis. This hypothesis analyzes the impact of credit rating announcements in two different time periods: before and after the Lehman Brothers' bankruptcy that occurred in September 15, 2008. Previous studies have shown contradictory results about the change in market efficiency.

The formulas 4 to 6 are used for the analysis, but the data sample periods are divided into two time periods, before and after the bankruptcy of Lehman Brothers. Afonso et al. (2012) point out the problem of having only four positive events after the Lehman Brothers bankruptcy. In this more recent dataset the number of positive events has increased into 42. The same regression is performed for bond indexes, yield spreads, CDS spreads and CDS basis. The first period includes the data from December 30, 1994 to September 14, 2008 and the second period includes the data from September 15, 2008 to February 2, 2015.

6. EMPIRICAL RESULTS

The results for the whole sample regressions are much in line with the previous studies presented in chapter 2.1. Regardless of a five year longer time period than used by Afonso et al. (2012), the results are within a very small marginal from their results for bond and CDS markets using the whole sample.

If the new regulation works like the European Commission has planned, the impact of credit rating changes on bond market should have weakened. This would mean that the market is more efficient. The new regulation should increase the predictability of the recently released credit ratings.

6.1 The results for the first hypothesis

First the bond indexes are analyzed for impacts from credit rating changes. The data for bond indexes is more comprehensive than the data for yield spreads, which makes this analysis more extensive. Simultaneously the lack of market impact can bias the results. Available data samples can be seen in table 6.

Table 6. Bond index changes of event countries during rating changes.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	0.57*** (4.41)	-0.87*** (-8.10)	0.40 (0.77)	-0.17 (-0.70)
Moody's	0.10 (0.76)	-0.93*** (-7.80)	-0.18 (-0.67)	-0.98*** (-5.31)
Fitch	0.11 (0.97)	-0.25** (-2.23)	-0.04 (-0.28)	-0.00 (-0.02)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates a change in bond index from t-1 to t+1.

The regression on bond indexes shows that upgrades from S&P are the only positive announcements that have an impact on bond indexes. Downgrades from all agencies lower the bond indexes and the announcements from Moody's have the largest impact. Negative revisions from Moody's have roughly equally large impact than actual downgrades from Moody's.

The regression on yield spreads shows also that upgrades from S&P are the only positive announcements that have an impact on yield spreads. An upgrade from S&P leads on average to -8.03 basis points lower yield spread. Downgrades and negative Outlook notations from S&P and Moody's increase the spread. Downgrades are the only announcements from Fitch that have an impact on yield spreads. A downgrade from S&P increases the spread for 16.31 basis points, while a downgrade from Fitch increases the spread for only 8.51 basis points. This means that the first hypothesis is rejected. The credit rating actions have an impact on yield spreads. There are no results for positive revisions for Standard & Poor's, because of small amount of positive revisions. Table 7 shows the results for the yield spread analysis. The results are in line with the results by Afonso et al. (2012).

Table 7. Yield spread changes of event countries during rating changes.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	-8.03* (-1.68)	16.31*** (3.99)	-	22.48** (2.21)
Moody's	-2.55 (-0.50)	15.80*** (3.45)	3.55 (0.35)	14.88** (2.15)
Fitch	-2.44 (-0.58)	8.51** (1.99)	1.03 (0.17)	5.12 (1.35)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. Yield spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from time t-1 to t+1.

The regression on CDS spreads shows slightly different results on table 8. Credit downgrades from all three agencies have an impact on CDS spreads and negative revisions from Moody's also increase the spread. The negative revisions from Moody's have a larger impact on CDS spread than downgrades from S&P or Fitch. In general, positive announcements decrease the spread and negative announcements increase the

spread, but interestingly the negative revisions from Fitch seem to lower the spread (significant on 15% level). The results are well in line with the results from different markets by Afonso et al. (2012), Hull et al. (2004) and Ismailescu and Kazemi (2010) i.e. mainly negative announcements have an impact on yield spreads.

Table 8. CDS spread changes of event countries during rating changes.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	-3.63 (-1.07)	8.18*** (3.79)	-	5.01 (1.01)
Moody's	-1.18 (-0.28)	17.13*** (6.79)	0.00 (0.00)	13.35*** (3.58)
Fitch	-0.89 (-0.27)	13.15*** (5.38)	-4.28 (-1.11)	-3.35 (-1.54)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. CDS spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

The analysis for the CDS basis accepts the first hypothesis on 10% significance level, which can be seen in table 9. None of the announcements have an impact on CDS basis in a three day window [1,-1]. Downgrades from S&P are significant on 15% level and negative revisions from Fitch ratings are significant on 20% level. CDS basis indicates the mispricing between CDS and bond markets. This means that credit rating actions do not cause significant mispricing between these two markets and therefore these markets work efficiently. The small amount of overlapping data between CDS spreads and yield spreads might bias the results. Only 15 countries with 3001 days of data were available for this analysis. 5 countries had no overlapping data for CDS spread and yield spread.

Table 9. CDS basis changes of event countries during rating changes.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	9.65 (1.04)	-9.58 (-1.63)	-	-13.19 (-0.92)
Moody's	-1.71 (-0.14)	-0.18 (-0.03)	0.14 (0.00)	0.21 (0.02)
Fitch	4.15 (0.48)	7.36 (1.15)	-4.97 (-0.45)	-7.52 (-1.29)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. Both, Yield spreads and CDS spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

6.2 The results for the second hypothesis

The second hypothesis investigates if credit rating actions are anticipated by bond and CDS markets in a one month window. The first regression on table 10 shows that the bond indexes are able to anticipate downgrades from all rating agencies and negative revisions from Moody's in a one month window. Negative revisions from Moody's have the strongest impact on bond indexes.

Table 10. Anticipation of rating changes in a one month window by bond indexes.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	0.12 (0.27)	-2.43*** (-6.88)	0.76 (0.43)	-0.74 (-0.88)
Moody's	0.07 (0.14)	-2.78*** (-6.71)	1.11 (1.24)	-3.13*** (-4.97)
Fitch	0.14 (0.35)	-1.45*** (-3.74)	0.52 (0.96)	-0.17 (-0.51)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-30,-1], which indicates the spread change from t-30 to t-1.

The results for the second hypothesis on yield spreads can be seen in table 11. Both, upgrades and downgrades from S&P and Fitch are anticipated by the yield spread in a one month window. Also negative revisions from Moody's are anticipated by the yield spread. Downgrades from Moody's are significant on 25% level. On average a 50 basis point move in a yield spread could indicate a future rating change from S&P or Fitch or negative revision from Moody's. The results are against the study by Afonso et al. (2012); in their study no anticipation is found in a one month window.

Table 11. Anticipation of rating changes in a one month window by yield spreads.

Rating Agency	Upgrade	Downgrades	Positive	Negative
S&P	-44.65*** (-3.13)	55.54*** (4.55)	-	-17.59 (-0.58)
Moody's	2.21 (0.14)	17.06 (1.24)	-1.05 (-0.09)	51.36** (2.49)
Fitch	-55.47*** (-4.41)	54.31*** (4.25)	-1.54 (-0.86)	15.19 (1.34)

Note: Upgrades and downgrades refer to actual rating changes. Positive and negative refer to the revisions. Yield spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-30,-1], which indicates the spread change from t-30 to t-1.

The anticipation analysis for CDS spreads on table 12 shows that the CDS market is more efficient than bond market in anticipating future rating changes. R-squared is 0.34 for CDS market, while it is 0.13 for bond indexes. Downgrades from all rating agencies and negative revisions from Moody's and Fitch Ratings are anticipated by the CDS market. Only positive announcement that is anticipated by the CDS market is the upgrade from Fitch ratings.

These results are much in line with the results by Hull et al. (2004) and Ismailescu et al. (2010), but against the results by Afonso et al. (2012). Downgrades and negative revisions are anticipated one month ahead by the first two studies. Afonso et al. (2012) were only able to find anticipation in a two month window before the event. The five years longer sample period that includes many crisis years could deviate the results from the ones from Afonso et al. who handle all ratings in two groups: positive and negative.

Table 12. Anticipation of rating changes in a one month window by the CDS market.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	5.88 (0.51)	65.71*** (9.02)	-	4.87 (0.29)
Moody's	4.70 (0.32)	31.95*** (3.75)	1.94 (0.03)	41.43*** (3.29)
Fitch	-27.71** (-2.50)	28.04*** (3.40)	-7.16 (-0.55)	26.41*** (3.56)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. CDS spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-30,-1], which indicates the spread change from t-30 to t-1.

The CDS basis is able to anticipate downgrades from Standard & Poor's on 10% significance level and downgrades from Fitch Ratings on 15% significance level. Upgrades from Standard & Poor's and Fitch Ratings are also anticipated by CDS basis. Negative revisions from Fitch are anticipated on 10% significance level. It can be seen from table 13 that all significant announcements drive the basis to the positive side. There seems to be mispricing before the rating changes between the CDS and bond markets, but the fact that the mispricing is changing could mean that the market is changing towards efficient prices already before the rating change. The first analysis in chapter 6.1 is not able to find change in mispricing just before the rating change.

Table 13. Anticipation of rating changes in a one month window by CDS-basis.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
S&P	89.24 (3.60) ***	28.67 (1.84) *	-	37.98 (1.00)
Moody's	10.50 (0.32)	17.27 (0.97)	-3.65 (-0.04)	-12.60 (-0.49)
Fitch	78.81 (3.47) ***	-24.91 (-1.46)	-7.75 (-0.27)	26.06 (1.66) *

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. CDS basis is expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-30,-1], which indicates the spread change from t-30 to t-1.

6.3 The results for the third hypothesis

The third hypothesis tests, if the impact of credit rating announcements has changed in time. The results show that the impact is different for the two periods for all four samples, which means that the third hypothesis is rejected.

It can be seen from table 14 that the third hypothesis is rejected for the bond indexes. The impact from credit rating announcements on bond indexes has changed in time. Before the Lehman Brother's bankruptcy the downgrades from S&P and negative revisions from Moody's were the only negative announcements that had an impact on bond indexes. Upgrades from S&P are the only positive announcements that are statistically significant.

After the Lehman Brother's bankruptcy downgrades from S&P and Moody's and negative revisions from Moody's have an impact on bond indexes. Rating upgrades from S&P are the only positive announcements that have an impact. Downgrades from Fitch ratings are significant on 15% level. This analysis shows that the market has not become more efficient during the recent years.

Table 14. Bond index changes of event countries during rating changes before and after Lehman Brothers bankruptcy.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
Pre-Lehman bankruptcy				
S&P	0.29*** (2.88)	-0.59*** (-3.51)	-0.09 (-0.20)	0.12 (0.39)
Moody's	0.09 (0.92)	0.29 (0.93)	-0.19 (-1.18)	-0.99** (-2.26)
Fitch	-0.02 (-0.21)	-0.09 (-0.48)	0.13 (1.09)	-0.02 (0.14)
Post-Lehman bankruptcy				
S&P	0.98*** (3.35)	-0.88*** (-5.42)	-	-0.25 (-0.62)
Moody's	0.12 (0.34)	-0.99*** (-5.56)	-	-0.95*** (-3.44)
Fitch	0.42 (1.36)	-0.27 (-1.55)	-0.45 (-1.13)	-0.01 (-0.07)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

The pre-Lehman sample on yield spreads in table 15 shows that negative revisions from all agencies and downgrades from S&P have an impact on yield spread. Upgrades from Moody's are the only positive announcements that have an impact on yield spreads. Negative revisions had the largest impact.

The analysis after the Lehman Brother's bankruptcy shows that the market efficiency has increased. Only downgrades from S&P and Moody's have an impact on yield spreads on a 10% significance level. None of the announcements from Fitch have an impact on the yield spreads. The results are against the results by Afonso et al. (2012); in their sample only negative announcements in pre-Lehman period were significant. In their analysis all announcements were handled in two samples: positive and negative.

Table 15. Yield spread changes of event countries during rating changes before and after Lehman Brothers bankruptcy.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
Pre-Lehman bankruptcy				
S&P	-1.64 (-0.83)	9.52*** (2.70)	-	19.48*** (3.50)
Moody's	-4.68** (-2.39)	-6.70 (-1.05)	3.50 (1.08)	15.66** (1.99)
Fitch	-0.06 (-0.04)	3.55 (0.90)	1.46 (0.61)	4.18** (1.97)
Post-Lehman bankruptcy				
S&P	-17.06 (-1.45)	17.28** (2.49)	-	23.89 (1.21)
Moody's	2.39 (0.16)	16.91** (2.28)	-	14.31 (1.25)
Fitch	-7.51 (-0.64)	9.01 (1.25)	0.43 (0.03)	5.45 (0.74)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. Yield spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

When analyzing the pre-Lehman period for CDS spreads, upgrades from S&P and positive revisions from Fitch are the only positive announcements that have an impact on CDS spread. Downgrades from S&P are the only negative announcements that have an impact. It can be seen from table 16 that the positive revisions from Fitch have the largest impact, lowering the spread for 7.51 basis points on average.

Table 16. CDS spread changes of event countries during rating changes before and after Lehman Brothers bankruptcy.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
Pre-Lehman bankruptcy				
S&P	-6.04** (-2.36)	4.03* (1.67)	-	0.20 (0.05)
Moody's	-1.97 (-0.54)	-1.23 (-0.20)	-0.16 (-0.03)	0.52 (0.08)
Fitch	-1.89 (-0.88)	0.37 (0.11)	-7.51*** (-3.35)	-0.56 (-0.35)
Post-Lehman bankruptcy				
S&P	-2.50 (-0.49)	9.17*** (3.19)	-	6.51 (0.94)
Moody's	-0.98 (-0.16)	17.71*** (5.61)	-	13.90*** (2.93)
Fitch	-0.21 (-0.04)	14.74*** (4.63)	-0.55 (-0.08)	-4.87 (-1.49)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. CDS spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

The results for credit rating announcements on CDS spreads in the post-Lehman period are substantially different from the results for pre-Lehman period. No positive rating actions have an impact on CDS spreads, while rating downgrades from all the agencies have an impact on the CDS spreads. Additionally, negative revisions from Moody's increase the spread. This analysis proves that the efficiency of the CDS market has not increased during the latest years.

The sample period could bias the results, because the period after the bankruptcy is more turbulent. The crisis countries like Greece, Spain, Italy, Ireland and Portugal have been rerated several times in the second period. The rating actions can be seen in appendix 1. These results are much in line with the results by Afonso et al. (2012); they also found out that the CDS market reacts more strongly on negative announcements after the Lehman brother's bankruptcy.

Expectedly from the first analysis the results for the CDS basis offer little information, which can be seen in table 17. The CDS basis in pre-Lehman period is only affected by positive revisions from Fitch ratings and negative revisions from Standard & Poor's. Both announcements drive the basis towards negative. None of the other announcements impact the basis.

In the post-Lehman period, none of the announcements have an impact on the basis. This means that the pricing between these two markets has become more efficient during the recent years in Europe. This analysis still needs some more data to confirm the results. The small amount CDS data might bias the results. Also some other time periods could be considered in addition to [-1,1].

Table 17. CDS basis changes of event countries during rating changes before and after Lehman Brothers bankruptcy.

Rating Agency	Upgrade	Downgrades	Positive revision	Negative revision
Pre-Lehman bankruptcy				
S&P	-6.00 (-0.96)	-4.22 (-0.87)	-	-19.43** (-2.56)
Moody's	0.48 (0.04)	7.04 (0.65)	0.26 (0.02)	-14.16 (-1.31)
Fitch	-2.12 (-0.46)	-2.54 (-0.41)	-10.82** (-2.01)	-4.03 (-1.33)
Post-Lehman bankruptcy				
S&P	13.87 (1.07)	-10.50 (-1.34)	-	-9.80 (-0.45)
Moody's	-2.02 (-0.12)	-0.34 (-0.04)	-	1.26 (0.10)
Fitch	7.32 (0.57)	8.51 (1.02)	-1.08 (-0.06)	-9.59 (-1.06)

Note: Upgrades and downgrades refer to actual rating changes and revisions refer to the anticipation of the rating. CDS spreads are expressed in basis points. T-statistics is expressed in brackets and equivalent significance at level of 1%, 5% and 10% are expressed with ***, ** and *. Time period for the analysis is [-1,1], which indicates the spread change from t-1 to t+1.

7. CONCLUSION

The purpose of this thesis was to investigate if credit rating announcements from the three largest credit rating agencies Standard & Poor's, Moody's Investors Service and Fitch Ratings have an impact on bond and CDS markets in Europe. The credit rating agencies were accused of causing the financial crisis and worsening the European sovereign debt crisis. This thesis studied the subject from three aspects. Firstly, do the credit rating announcements have an impact on bond and CDS markets? Secondly, can bond and CDS markets anticipate the future credit rating changes? Thirdly, has the impact of credit rating announcements changed before and after the Lehman Brothers' bankruptcy? Additionally the CDS basis is used to study the mispricing between bond and CDS markets, which has not been taken into account in earlier studies.

A fixed effects panel regression is used for performing the analysis. The country and time variables are fixed. The data consists of bond and CDS data for 20 European countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Spain, Sweden and United Kingdom. The data sample begins 30.12.1994 and ends 11.2.2015, which means that the data sample is extended by five years compared to the reference study by Afonso et al. (2012). This enables also the studying of the impacts of the European sovereign debt crisis.

The first hypothesis investigated if the bond (CDS) market is efficient and not effected by credit rating announcements. The hypothesis was rejected for all other factors than CDS basis. The credit rating actions do have an impact on bond and CDS markets. The analysis with CDS basis shows that the pricing between these two markets is efficient in a two day window, during rating changes in Europe.

Downgrades from all rating agencies have an impact on yield spreads. Negative revisions from Standard & Poor's and Moody's also have an impact on the yield spread. Upgrades from Standard & Poor's are the only positive announcements that have impact on yield spreads. The results for the CDS spread are in line with the results for yield spread for the first hypothesis. Downgrades from all three rating agencies increase the spread. Depart from yield spreads the negative revisions from Moody's increase the CDS spread. These results indicate that the bond and CDS markets are not totally efficient. The credit rating announcements are composed from publicly available data

that is available for all investors. If the markets were efficient, the credit rating actions would not have any impact on these markets.

The second hypothesis analyzed if the credit rating announcements are anticipated by bond market, CDS market and CDS basis in a -30 to -1 day window. The hypothesis is rejected for all data samples. The yield spread is able to anticipate downgrades from Standard & Poor's and Fitch ratings and negative revisions from Moody's. Upgrades from Standard & Poor's and Fitch Ratings are also anticipated. The CDS spread is able to anticipate downgrades from all the three agencies and negative revisions from Moody's and Fitch. Upgrades from Fitch are the only positive announcements that are anticipated.

The CDS basis is able to anticipate upgrades from S&P and Fitch and downgrades from S&P. Negative revisions from Fitch are the only revisions that are anticipated. This analysis proves that there is mispricing between bond and CDS markets in a one month window before the rating change and the mispricing is larger before positive announcements. All rating actions drive the CDS basis towards positive values, but upgrades have the largest impact. Previous studies have shown that the CDS market leads the pricing process between these two markets.

The third hypothesis analyzed if the impact of credit rating announcements has changed over time. The sample is divided into two groups: before and after the Lehman Brothers' bankruptcy. The results for the yield spread shows that the impact of credit rating announcements has changed in time. Before the bankruptcy all negative revisions and downgrades from S&P increased the spread. Upgrades from Moody's were the only positive announcements that have a significant impact on yield spread. After the bankruptcy only downgrades from S&P and Moody's have a significant impact on yield spread.

The results for CDS spread before the bankruptcy show that upgrades and downgrades from S&P and positive revisions from Fitch have an impact on the CDS spread. After the bankruptcy downgrades from all agencies and negative revisions from Moody's have an impact on the CDS spread. Expectedly positive announcements decrease the spread and negative announcements increase the spread.

The third hypothesis is rejected, which means that the impact from credit rating announcements have changed in time. One would expect that the market efficiency

would have increased in time. The yield spread analysis shows that a smaller amount of rating actions impact the spread after the bankruptcy, but the magnitude of impact has not decreased. The CDS spread analysis shows that the impact from rating changes has increased in time. These results are in line with the results from Afonso et al. (2012). The CDS basis analysis shows that the pricing between these two markets has improved in time. The timing of this analysis could bias the results for the third hypothesis. The market is reasonably calm for the first sample and the second sample is dated in crisis years.

These results indicate that the rating agencies still have a significant role for investors in Europe. The market is able to anticipate the future rating changes, but there is still a large correction in prices around the rating announcement. CDS basis analysis shows that the pricing between bond and CDS markets is effective around the rating announcements.

The contribution of this thesis comes from taking into account the CDS basis and using longer sample period than in the previous studies. The CDS basis indicated that the pricing between bond and CDS markets is efficient around the rating announcement, but some mispricing can be found one month before the rating announcements. In this study each rating announcement and all the three rating agencies have been analyzed separately. This provides more precise information about the impact of each rating announcement for the investors.

It would be interesting to repeat the study after the effects of the European sovereign debt crisis have disappeared. Is the inefficiency of the bond and CDS markets found in this study entirely caused by the European debt crisis and the structural deficit of Greece? What kind of results would be received if the countries were categorized in groups based on credit ratings?

Future studies could also extend the research area by including larger geographical sample of countries. It might be interesting to compare the efficiency of different bond and CDS markets of different continents. Would the CDS basis give more significant results for example for emerging markets?

REFERENCES

- Alsakka, Rasha & Owain ap Gwilym (2012). Foreign Exchange market reactions to sovereign credit news. *Journal of International Money and Finance* 31: 845-864.
- Alsakka, Rasha & Owain ap Gwilym (2013). Rating agencies' signals during the European sovereign debt crisis: Market impact and spillovers. *Journal of Economic Behavior & Organization* 85, 144–162.
- Alsakka, Rasha, Owain ap Gwilym & Tuyet Nhung Vu (2014). The sovereign-bank rating channel and rating agencies' downgrades during the European debt crisis. *Journal of International Money and Finance* 49, 235-257.
- António, Afonso, Davide Furceri & Pedro Gomes (2012). Sovereign credit ratings and financial markets linkages: application to European data. *Journal of International Money and Finance* 31, 606–638.
- Blay, M. Benjamin & Brian S. Roseman (2014). The reaction of European credit default swap spreads to the U.S. credit rating downgrade. *International Review of Economics and Finance* 34, 131-141.
- Bodie, Zvi, Alex Kane & Alan J. Marcus (2011). *Investments and portfolio management: Global edition*. 9 ed. New York.: McGraw-Hill Companies Inc. 1019 p. ISBN 978-007-128914-6.
- Boffelli, Simona & Giovanni Urga (2015). Macroannouncements, bond auctions and rating actions in the European government bond spreads. *Journal of International Money and Finance* 53, 148-173.
- Bolton, Patrik, Xavier Freixas & Shapiro Joel (2012). The Credit Ratings Game. *The Journal of Finance* 67:1, 85-111.
- Choudhry, Moorad (2004). The credit default swap basis: Analyzing the relationship between cash and synthetic credit markets. *Derivatives Use, Trading & Regulation* 10:1, 8-26.

Choudhry, Moorad (2010). *Securities Institute: Introduction to Bond Markets*. 4 ed. West Sussex. John Wiley & Sons Ltd. 474 p. ISBN 978-047-068724-6.

Choudhry, Moorad (2010). *Structured credit products. Credit derivatives & synthetic Securitisation*. 2 ed. Hoboken. John Wiley & Sons. 601p. ISBN 978-0-470-82413-9.

Grammatikos, Theoharry & Robert Vermeulen (2012). Transmission of the financial and sovereign debt crises to the EMU: Stock prices, CDS spreads and exchange rates. *Journal of International Money and Finance* 31, 517-533.

Gündüz, Yalin & Orcun Kaya (2014). Impacts of the financial crisis on Eurozone sovereign CDS spreads. *Journal of International Money and Finance* 49,425-442.

Vu, Huong, Rasha Alsakka & Owain ap Gwilym (2015). The credit signals that matter most for sovereign bond spreads with split ratings. *Journal of International Money and Finance* 53: 174-191.

European Commission (2013). New rules on credit rating agencies (CRAs) enter into force – frequently asked questions. MEMO: 13, 571.

Fama, Eugene F (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance* 25:2, 383-417.

Federal Reserve Bank of ST. Louis (2011). *Full Timeline* [online]. Full Timeline of the financial crisis [cited 18 April 2015]. Available from World Wide Web: URL: <https://www.stlouisfed.org/financial-crisis/full-timeline>.

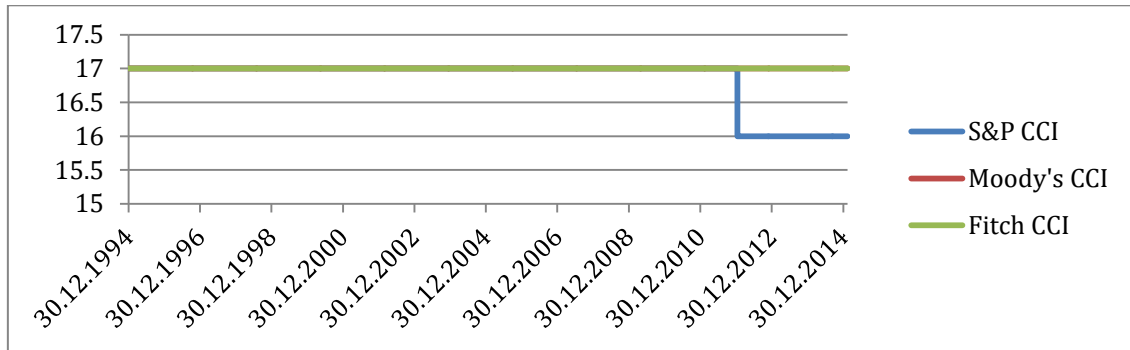
Gande, Amar & David C. Parsley (2005). News spillovers in the sovereign debt market. *Journal of Financial Economics* 75, 691-734.

Hull, John, Mirela Predescu & Alan White (2004). The relationship between credit default swap spreads, bond yields, and credit rating announcements. *Journal of Banking & Finance* 28, 2789-2811.

- Iuliana, Ismailescu & Hossein Kazemi (2010). The reaction of emerging market credit default swap spreads to sovereign credit rating changes. *Journal of Banking & Finance*, 34, 286-2873.
- Norden, Lars & Martin Weber (2004). Information efficiency of credit default swap and stock markets: The impact of credit rating announcements. *Journal of Banking & Finance*, 28: 2813-2843.
- Ong, Michael K. (2002). *Credit ratings: Methodologies, Rationale and Default Risk*. London: Risk Waters Group Ltd. 535 p. ISBN 1-899-332-69-3.
- Steiner, Manfred & Volker G. Heineke (2001). Event study concerning international bond price effects of credit rating actions. *International Journal of Finance & Economics* 6:2, 139-157.
- Werner, Richard A. (2014). Enhanced Debt Management: Solving the Eurozone crisis by linking debt management with fiscal and monetary policy. *Journal of International Money and Finance* 49, 443-469.

Appendix 1. Graphs about the CCI scale per agency per country

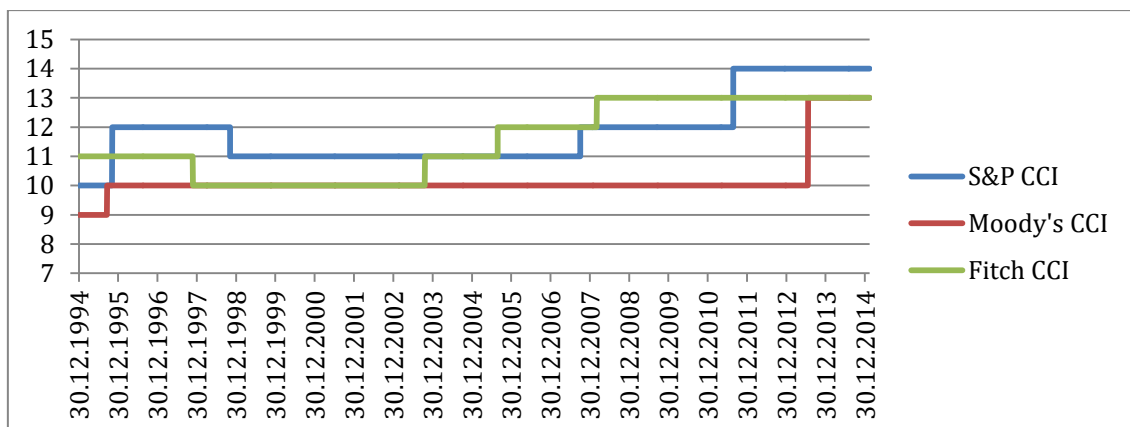
CCI Per agency for Austria



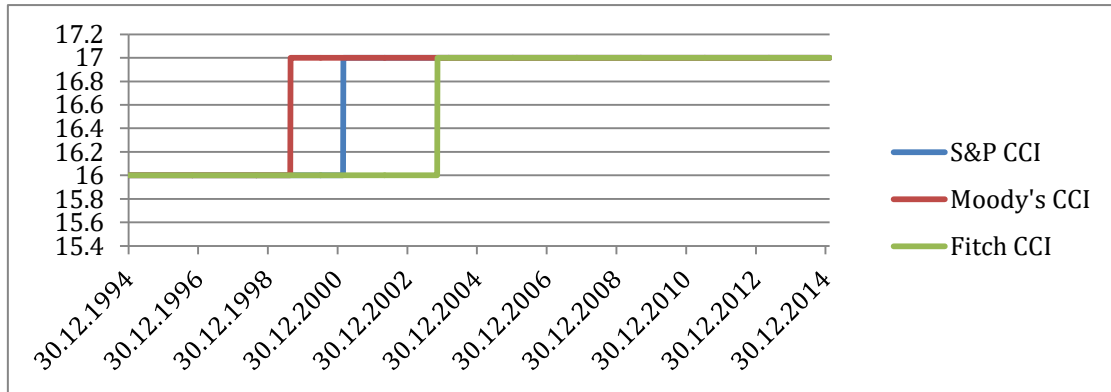
CCI Per agency for Belgium



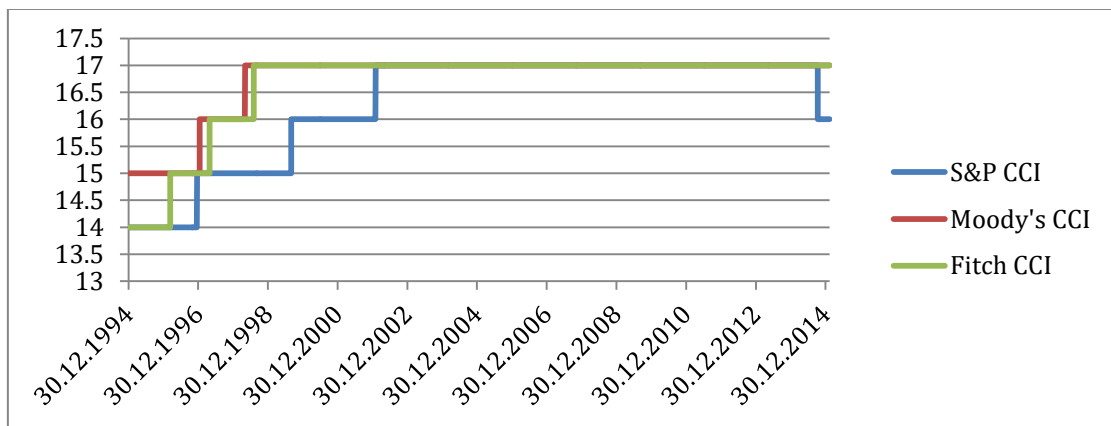
CCI Per agency for Czech Republic



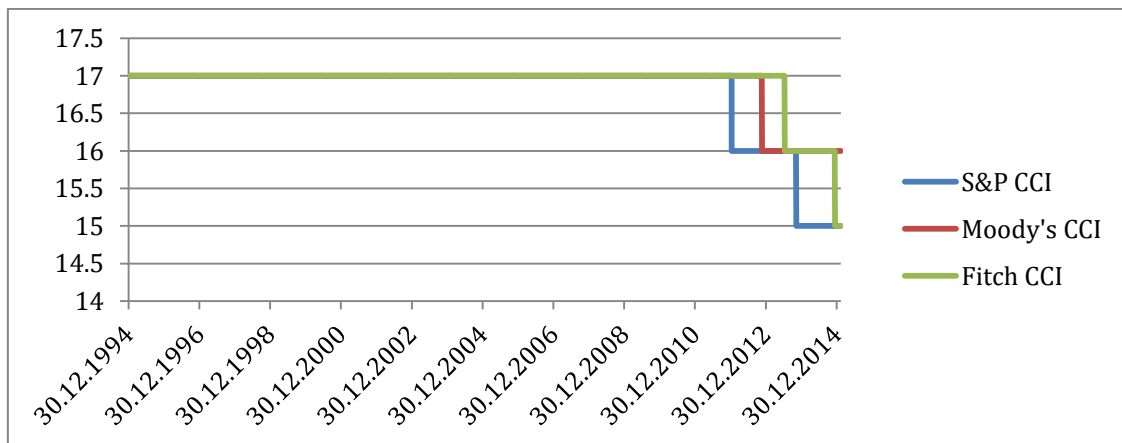
CCI Per agency for Denmark



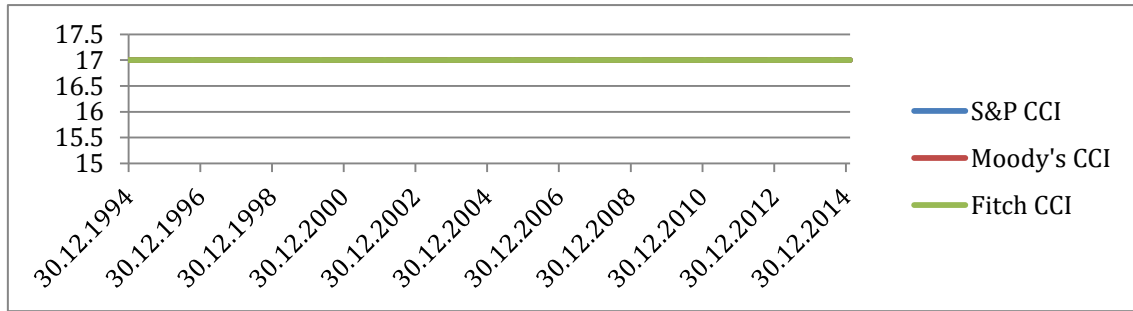
CCI Per agency for Finland



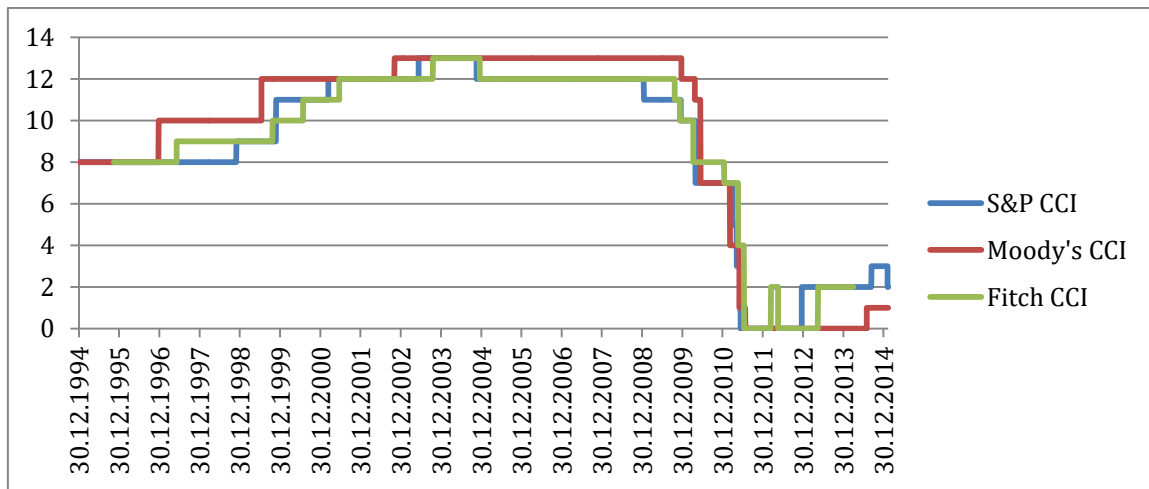
CCI Per agency for France



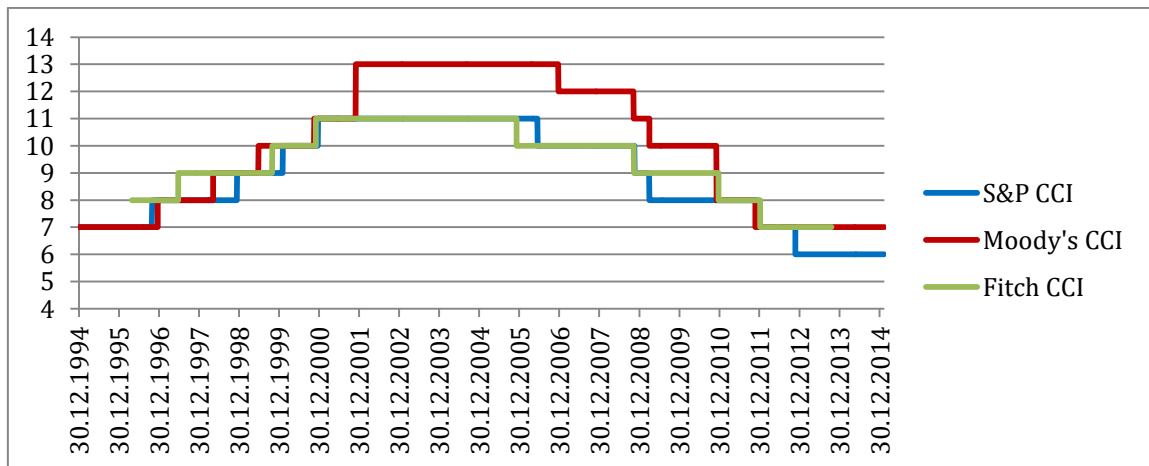
CCI Per agency for Germany



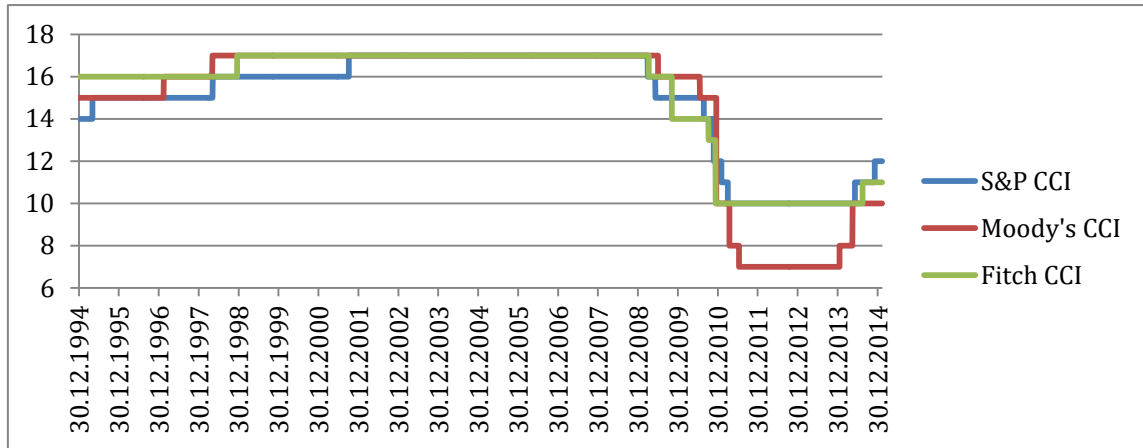
CCI Per agency for Greece



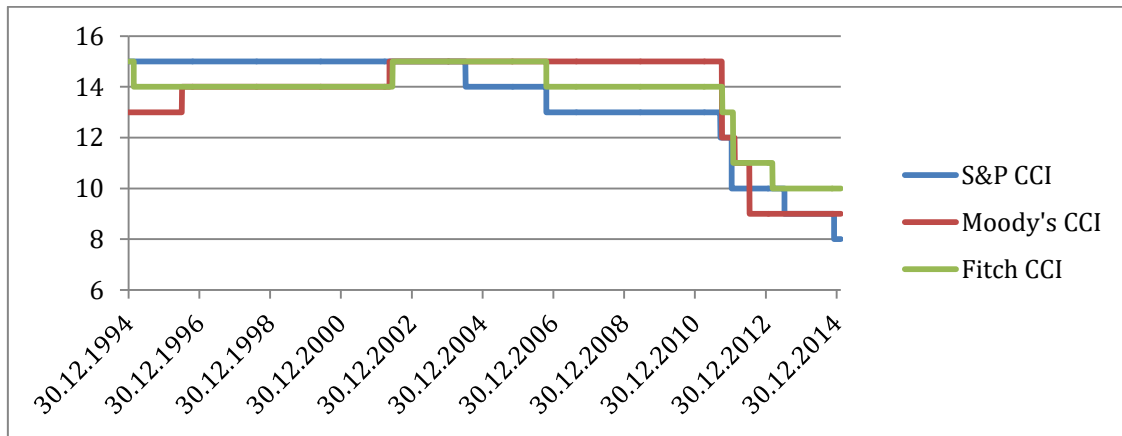
CCI Per agency for Hungary



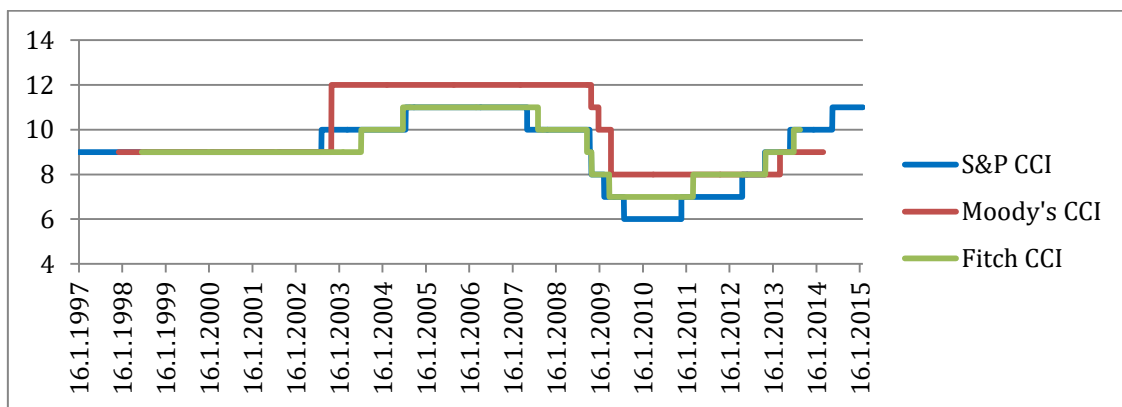
CCI Per agency for Ireland



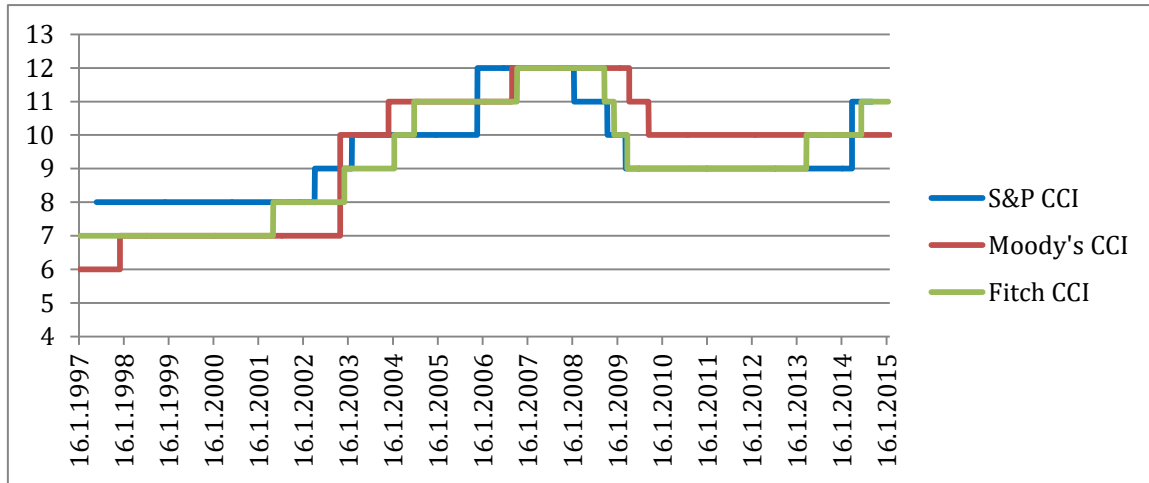
CCI Per agency for Italy



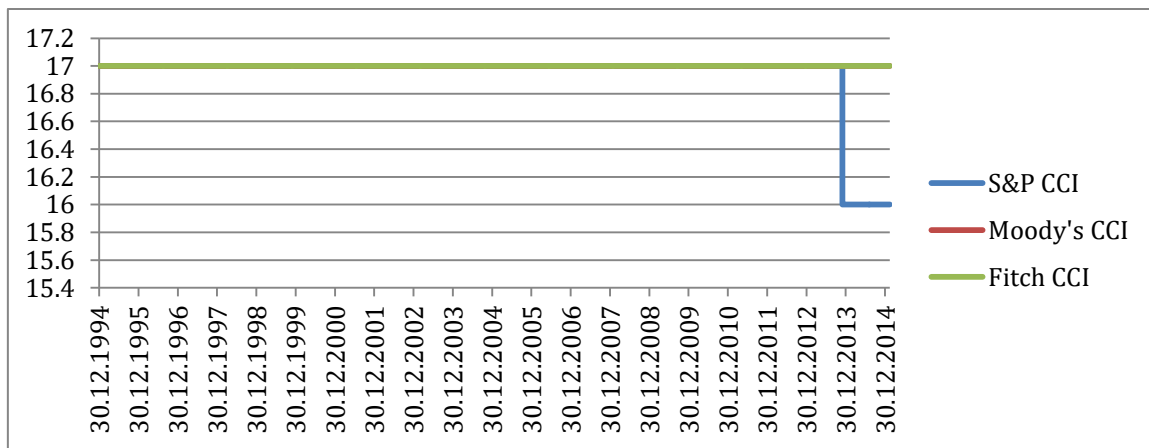
CCI Per agency for Latvia



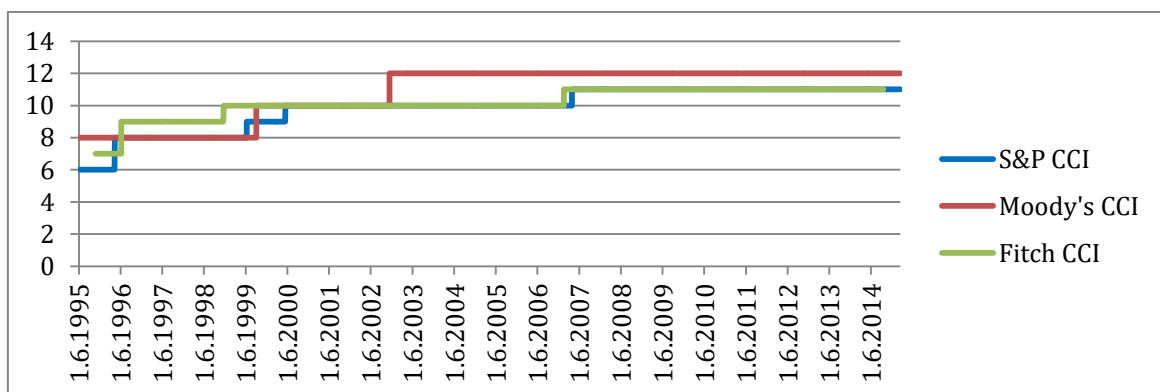
CCI Per agency for Lithuania



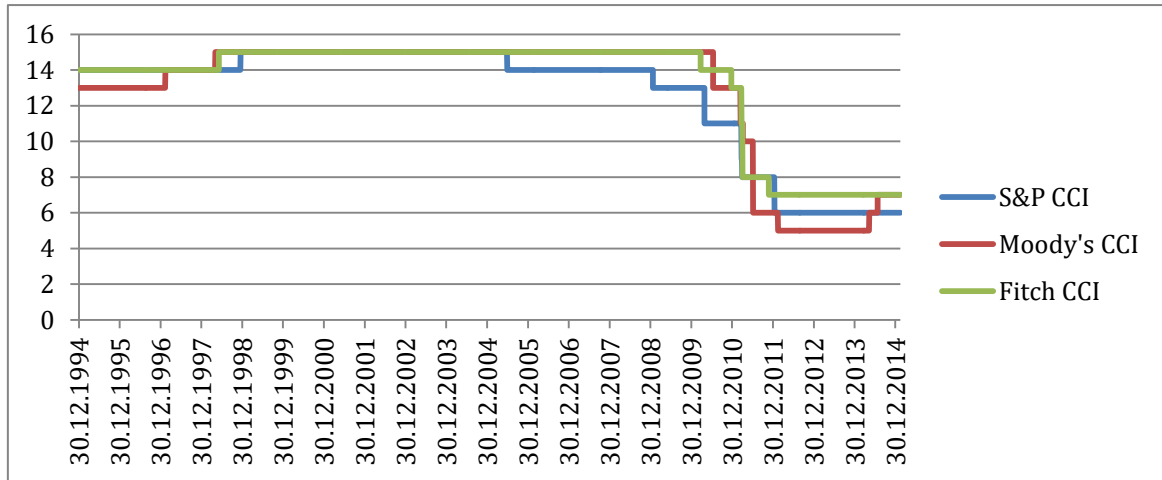
CCI Per agency for Netherland



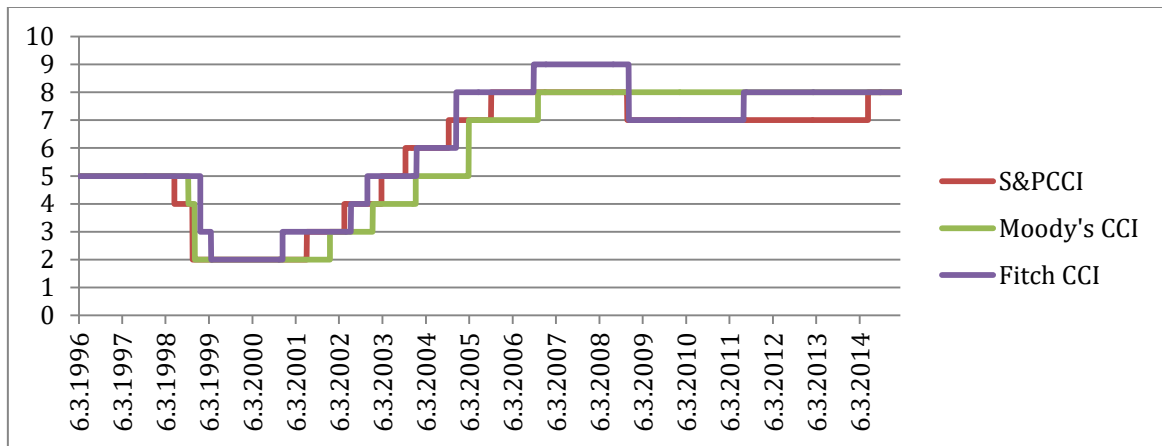
CCI Per agency for Poland



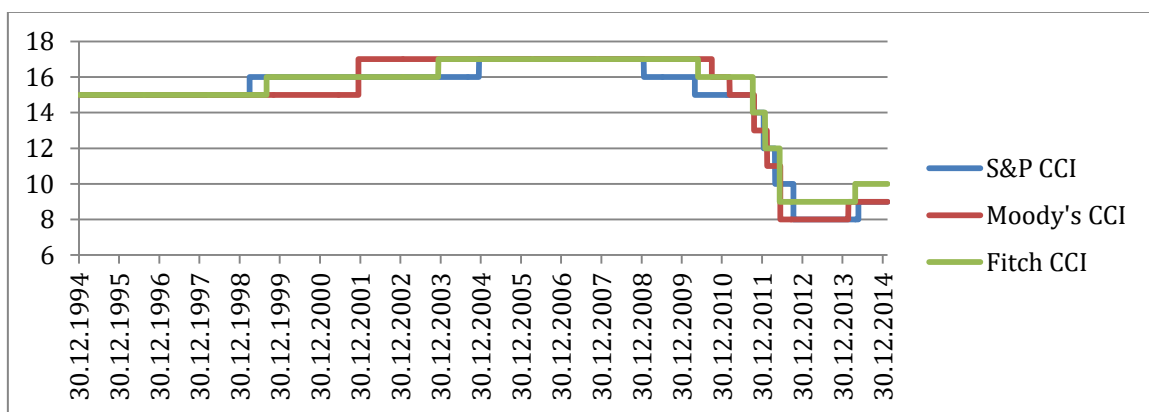
CCI Per agency for Portugal



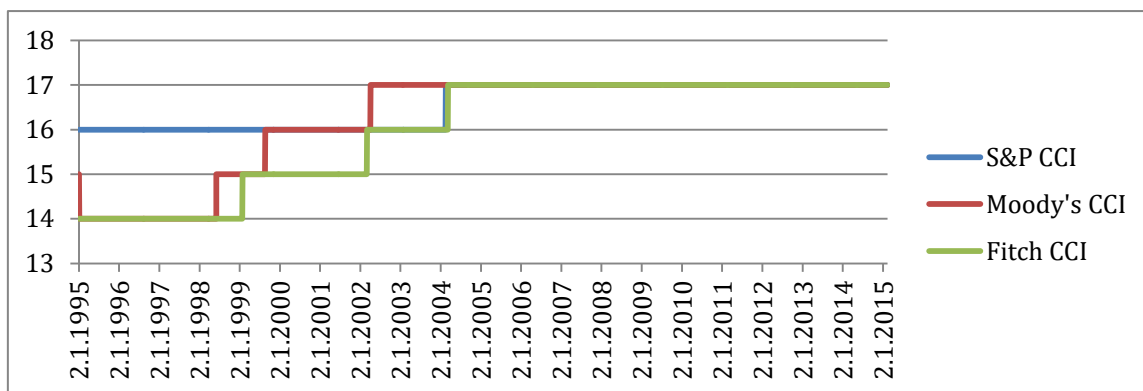
CCI Per agency for Romania



CCI Per agency for Spain



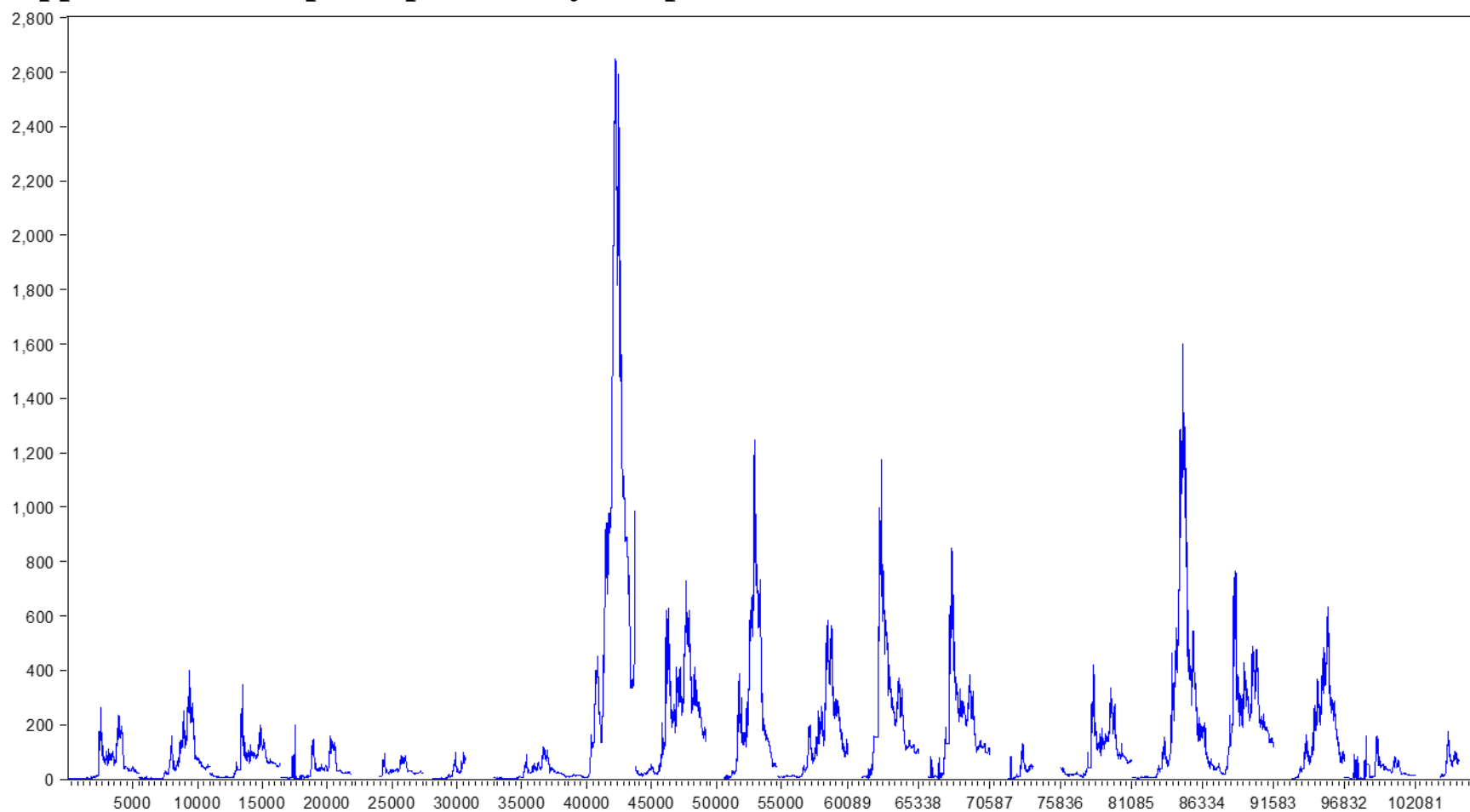
CCI Per agency for Sweden



CCI Per agency for United Kingdom



Appendix 2. CDS spread per country in alphabetical order



Note: The countries are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Spain, Sweden and United Kingdom. CDS spread is presented in basis points in y-axis and time is presented in x-axis by country.